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UNITED STATES

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NATIONAL MARINE FISHERIES SERVICE

COMMERCIAL FISHERIES RESEARCH AND DEVELOPMENT ACT

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ABSTRACT

In 1984, the Massachusetts Division of Marine Fisheries monitored relative abundance of fish stocks in state territorial waters for the sixth year by standardized research vessel bottom trawl surveys. In three-week, daytime, spring and autumn cruises, 99 and 94 stations, respectively, were completed. Seasonal abundance and distribution of 26 finfish and shellfish species were described by comparing area weighted relative abundance indices (stratified mean catch in kilograms and number per tow) to 1978-83 indices.

In spring, Massachusetts' most important commercial finfish exhibited a lower level of biomass than in 1983. These included Atlantic cod (Gulf of Maine stock), yellowtail flounder (Cape Cod ground), winter flounder, American plaice, witch flounder, summer flounder, longfin squid, and black sea bass. The first three species' indices continued a three to six year downward trend to timeseries lows. The latter three migrants, as well as northern searobin, were in unusually low biomass suggesting that if they were not really less abundant, then they were somewhat later arriving inshore.

In autumn, the 'all species' number index decreased for the third straight year to a timeseries low. There was a continued downward trend in groundfish biomass, e.g., yellowtail flounder and winter flounder, and further declines in some pre-exploitable size fish, indicating reduced recruitment prospects for yellowtail flounder, scup, butterfish, and longfin squid, and Gulf of Maine haddock and cod. Black sea bass were abundant and young-of-the-year number index was exceptionally high. Seasonal bottom temperatures were only slightly below timeseries averages; surface waters were less saline than usual.

A 10 year timeseries of winter flounder young-of-the-year abundance indices from standardized estuarine seine indices conducted on the south shore of Cape Cod has predicted annual changes in strength of recruiting cohorts as shown by age composition of recent inshore research trawl catches and trends in commercial landings. With the stock unit presumably fully exploited and only average recruitment expected, landings of winter flounder should continue to decline in 1985. Following the poorest seine index in the timeseries, the 1984 index was the second lowest, forecasting a sharp downturn in 1986 landings with only marginal improvement in 1987.

Job 1: Fishery Resource Assessment, Coastal Massachusetts

INTRODUCTION

The Massachusetts Division of Marine Fisheries (DMF) has conducted a semiannual bottom trawl survey of marine waters within the jurisdiction of the Commonwealth since 1978. State territorial waters are described by a three nautical mile wide border extending from Rhode Island to New Hampshire boundaries including Cape Cod Bay and Nantucket Sound. Specific cruise objectives were to: 1) estimate relative abundance of groundfish and certain shellfish species in terms of weight and number; 2) determine periodic trends in fish abundance, population structure, and species composition; 3) collect information on age and growth, maturity, mortality, and recruitment; and 4) describe groundfish distribution in relation to temperature, salinity, and depth.

This survey series has been partially funded through the Commercial Fisheries Research and Development Act (PL 88-309) through 1985 under project 3-375-R. The 1978-1983 cruises have been fully described (Howe et al. 1983). This report summarizes the general status of fisheries resources noted on the 1984 cruises (#8491 and #8492).

FIELD AND ANALYTICAL PROCEDURES

The National Oceanic and Atmospheric Administration's (NOAA) R/V GLORIA MICHELLE (65', 365 SHP) was chartered for both 1984 cruises. The DMF provided standard sampling gear - a 3/4 North Atlantic type two-seam trawl (39' headrope/51' footrope). Net mesh varied depending upon the section (3.5", 2.5", 1.5") and the codend liner measured 0.64 cm (0.25"). The trawl was fished with a rubber disc (3.5") chain sweep, rectangular wooden doors (6' x 40", 325 lbs.) and 10-fathom legs.

The study area was divided into 5 physiographic regions which were subdivided into depth strata (Figure 1). Individual strata were grouped by regions (strata sets) to make data meaningful for resource managers. The regions are: 1) Buzzards Bay, Vineyard Sound, and coastal waters south of Martha's Vineyard; 2) Nantucket Sound; 3) east of Cape Cod, Race Point to Muskeget Island; 4) Cape Cod Bay; and 5) Massachusetts Bay north to the New Hampshire border.

One hundred stations were allocated to strata approximately in proportion to the area of each stratum (Table 1). General station locations were predetermined by conventional random selection methods. If towable bottom was unavailable at the designated location, alternate sites within that stratum were utilized. As on previous surveys, 20 minute daytime tows were made along depth contours at a speed of 2.5 knots with trawl warp scoped at 3:1.

In processing the catch, standard survey techniques and trawl logs were employed. Following the catch sort by species, weights and length frequencies were recorded. Materials for aging, requested special samples, and biological observations were routinely collected.

Standard survey abundance indices were computed using Northeast Fisheries Center (NEFC) and DMF software and the Woods Hole Oceanographic Institute's Digital VAX-11/750 computer. Completed trawl logs were entered by NEFC personnel. Station and biological data were audited to detect recording and entry errors and processed by DMF personnel using the NEFC Survey Analysis Program (SURVAN). For each designated species, SURVAN computed mean catch/tow in kilograms and numbers by strata, strata set, and cruise, then produced an average individual weight, and length frequency listing. Total weight and numbers by species for each tow, stratum, strata set, and cruise were computed by the DMF SPPTOT program. For each of 26 species, two survey indices are presented: the stratified mean catch per tow (kilograms) for all strata sets, 1978-1983, and the stratified mean number per tow by length frequency interval (cm) and region, 1984 (Appendix tables 2-54).

RESULTS AND DISCUSSION

A summary of 1984 survey cruise effort and collections is presented in Table 2. A total of 201,243 organisms weighing 46,654.2 kg and representing 90 fish and shellfish species were collected and processed during 1984 surveys (Table 3). Sixteen species comprised 93% of catch weight and 80% of the total catch in number for 1984.

SPRING CRUISE #8491

Research vessel survey indices of abundance in spring, 1984, documented a continued decline in coastal fishery resources for the third consecutive year. The biomass (weight) index for 'all species' decreased 29% from 1981. A 17% decrease from the previous spring was attributed to further declines in survey indices for nearly all of the state's most important commercial species including: Atlantic cod, all principal flounder species, black sea bass, and longfin squid. Another factor was a 91% decline in northern searobin, a non-utilized species that usually constitutes a significant proportion of trawlable biomass because of its vulnerability while in pre-spawning aggregations.

For species caught principally in the inshore waters of the Gulf of Maine, decreases in biomass for red hake (46%) and white hake (67%) reflected the presence of no stronger than average year-classes for age-groups 1-3 and fewer older fish. The number index of young-of-the-year (YOY) cod ($\leq$ 14 cm) taken north of Cape Cod (Gulf of Maine stock) declined for the fourth consecutive spring and was the lowest in the time-series. Similarly, the juvenile ($<$ 37 cm) index declined sharply from 1983 and was 85% below the average, suggesting further declines in recruitment. It was the first spring cruise that so few YOY cod were taken east and south of Cape Cod (Georges Bank stock).

Yellowtail flounder biomass (Cape Cod ground) continued to decrease (56%) from a 1981 high to a timeseries low. Commercial landings from Massachusetts inshore waters have declined 81% since 1979. Following a 32% increase in the 1983 autumn pre-recruit (age 1) index, small fish were more plentiful in May, 1984 than in 1983 though only about one-half as abundant as the timeseries average. Witch flounder (grey sole) biomass also declined from both 1983 (19%) and the timeseries mean (40%). American plaice (dab) biomass and number have declined 64% and 58%, respectively, from the 1981 high. Dab and grey sole yearlings were relatively unavailable, suggesting that no upturn in recruitment was imminent.

Ocean pout (eel pout or ling) and longhorn sculpin have shown a trend of increasing abundance since 1978. In early 1984, a small directed pout fishery occurred in Cape Cod Bay; concomitantly, the spring survey weight index declined 9% and the number index increased 21%. While there was a general increase in abundance of pout < 60 cm, there was a marked reduction of those > 75 cm. Previously, fish up to 90 cm were common. Biomass of longhorn sculpin, a non-utilized species, was at its highest level of the timeseries; the number index rose 20% due to a succession of apparently above average year-classes (1981-83) as discerned from length data.

The coastwide silver hake (whiting) biomass index increased 53% over the 1983 index reflecting growth of the abundant 1982 year-class particularly evident south and east of Cape Cod (southern stock), and less recruitment from the 1983 and 1984 year-classes. While the overall number index remained almost static, the number of whiting taken north of Cape Cod (northern stock) declined 42% from 1983; the southern stock catch increased 46%.

Since 1981 there has been a 52% decline in commercial landings of winter flounder (blackback) taken from Massachusetts inshore waters; however, coastwide abundance indices have not shown a consistent downward trend for this period. The most likely reason for this discrepancy is annual variation in the timing of post-spawning flounder emigration relative to the standard survey period. A delayed out-migration apparently occurred in 1983 when the coastwide biomass index rose 60%. In 1984, the biomass index declined 35% and was 29% lower than the 1981 timeseries high. The prerecruit portion (i.e., < 27 cm) of the total catch was 41% lower than last year and 19% below the timeseries average.

Survey catches south and east of Cape Cod suggested that some migrant species, if not less abundant, were somewhat later arriving in southern New England inshore waters in 1984. The previously mentioned northern searobin decline was the most obvious example but there were several others. Summer flounder were less abundant than on any previous spring survey; the numerical index was down 75% from 1983. Similarly, black sea bass were down 63% in number from the spring before even though 1983 commercial landings were high.

Partly due to a much-publicized gubernatorial reversal of an internal waters processing operation and the squid's late arrival, the anticipated Loligo fishery did not match expectations. Survey catches, composed primarily of market-size individuals, declined 34% in weight from the 1983 record high level and mirrored the trend in commercial landings for the seventh year in a row.

Two migrant species more abundant in 1984 were butterfish and scup. Butterfish (one-year-olds) were more plentiful than in any spring since 1980. Scup weight and number indices were up 97% and down 29% from 1983, indicating that more large but fewer small and yearling fish were available. This followed a 32% decline in the Massachusetts' 1983 autumn pre-recruit scup index (age 0). Multi-age survey catches occurred in 1978-80; in 1981-83, they were more bimodal. Weight and number indices were still 66% and 85% below timeseries means.

More sedentary species also displayed downturns in abundance, although not without exception. The biomass index for windowpane, a flounder that is usually lightly landed and routinely discarded, has continued to decline (65%) from its peak in 1982, the last year a strong recruiting cohort was evident. No upturn in recruitment was predicted from catch-at-length data. The trend in little skate biomass has been downward since 1981; the 1984 index was 42% below the timeseries average. In contrast, the trend for winter (big) skate biomass has been generally upward and in 1984 was 78% above average. Because of one very large catch, tautog indices rose more than one and one-half times over 1983 levels to timeseries highs.

It appears that offshore conditions may have delayed immigration because all sampling strata shallower than 27 m (15 f) south and east of Cape Cod were slightly warmer than in 1983 (Appendix Table 1); therefore, migrating species could have been expected to arrive on schedule. For strata north of the Cape, water temperatures were generally cooler so unavailability of resident species would not appear to be an explanation for their generally low abundance. As shown below, the mean bottom water temperature recorded during the spring survey was slightly lower than that of 1983 and 7% below the timeseries average. Average surface salinity was the lowest in the timeseries due to unprecidented winter rainfall and subsequent runoff.

SPRING

		Average Temperature (°C)		Average Salinity °/oo
Year	Cruise dates	Surface	Bottom	Surface
1978	12 May-11 Jun	13.1	10.7	30.9
1979	30 Apr-27 May	11.2	8.9	30.9
1980	5 May-24 May	10.6	9.1	31.9
1981	6 May-21 May	9.8	8.5	30.7
1982	4 May-21 May	10.2	7.8	31.9
1983	9 May-25 May	10.3	8.9	31.1
1984	7 May-22 May	10.6	8.3	29.4

AUTUMN CRUISE #8492

The 'all species' number index fell 56% from 1983, highlighted by further declines in pre-exploitable size fish and a continued downward trend in groundfish biomass. Groundfish, always in relatively low abundance in September because of near maximum bottom water temperatures, were dramatically less abundant in 1984. Species declining included white hake (84%), witch flounder (84%), yellowtail flounder (66%), red hake (58%), American plaice (53%), and winter flounder (36%), the last five reaching their lowest level (biomass or number) in the timeseries.

Also at a timeseries low was silver hake. With only the northern stock available inshore in autumn, biomass and number indices declined 35% and 62%, respectively, from the previous fall. Catch-at-length data indicated that the 1983 year-class at age 1 was the weakest in the timeseries. The 1982 year-class, observed north of Cape Cod the previous year in only moderate numbers, continued to show average strength at age 2.

The 43% increase in the 'all species' biomass index over that of 1983 was primarily due to a 206% increase in spiny dogfish biomass. Only three of 25 other monitored species were more abundant (by weight) than in 1983. Two of these included Atlantic herring, taken mainly north of Cape Cod, which increased 30%, reflecting a higher proportion of age 3 and older fish present in local waters, and adult tautog (> 20 cm), taken mainly south of the Cape, which were atypically common for autumn survey catches. Also taken primarily south of the Cape were summer flounder and windowpane that showed just 2% and 15% declines in the weight index, respectively.

American lobster and rock crab are more active in the warmer bottom water temperatures of autumn than they are in spring; accordingly they are usually about three times more available (by number) to the research trawl in September. Compared to 1983, lobster and rock crab biomass declined 18% and 14%, respectively. The lobster prerecruit molt group (67-80 mm) index decreased 29%.

For other species of commercial importance, autumn survey catches provide relative estimates of pre-recruit fish. Not since 1978 has an autumn survey catch of cod (Gulf of Maine stock) showed a pronounced 4 cm modal length, the result of a late hatch; nevertheless, the 1984 year-class appears to have been the weakest in the timeseries. The juvenile cod number index was 92% below the timeseries average, reflecting the weakness of the 1983 year-class. Pre-recruit yellowtail flounder were as scarce as they were in 1981, when the timeseries low occurred, and about 70% fewer than the relatively weak indices of the last two years.

A virtual absence of age 0 haddock in fall survey catches probably signifies a poor 1984 year-class. Their occurrence north of Cape Cod in 1978, 1980, and 1982 has proven, in retrospect, to be a reasonably good indicator of at least moderate strength cohorts of the Gulf of Maine stock.

The pre-recruit index for black sea bass, a species primarily taken south of Cape Cod, was encouraging. Judging by a record high 1984 survey weight index and 1984 commercial landings from inshore waters, black sea bass were very abundant locally as was production. The autumn pre-recruit index (age 0) was more than 10 times greater than the timeseries average.

More pessimistic recruitment prospects appear to be in the offering for other important species. From a timeseries high in 1982, YOY number indices for butterfish, Loligo squid, and scup have declined for the second year in a row (71%, 69%, and 46%, respectively) with seasonally accessed production 74%, 70%, and 37% below the timeseries means. The age 1 scup index increased 36% over 1983.

Compared to 1983 bottom temperature data available for four or five sampling regions, 1984 bottom temperature decreased an average of 1.2° C to a mean value just below the timeseries average (13.7° C). Average surface salinity was comparatively low.

AUTUMN

		Average Temperature (°C)		Average Salinity °/₀₀
Year	Cruise dates	Surface	Bottom	Surface
1978	5 Sep- 2 Oct	16.1	12.8	31.8
1979	11 Sep- 4 Oct	15.3	12.6	31.5
1980	8 Sep-29 Sep	17.8	14.3	31.8
1981	14 Sep- 5 Oct	16.4	15.4	31.7
1982	8 Sep-27 Sep	17.0	13.3	32.5
1983	7 Sep-24 Sep	19.5	*	31.7
1984	10 Sep-27 Sep	17.3	13.5	31.1

*Instrument malfunction

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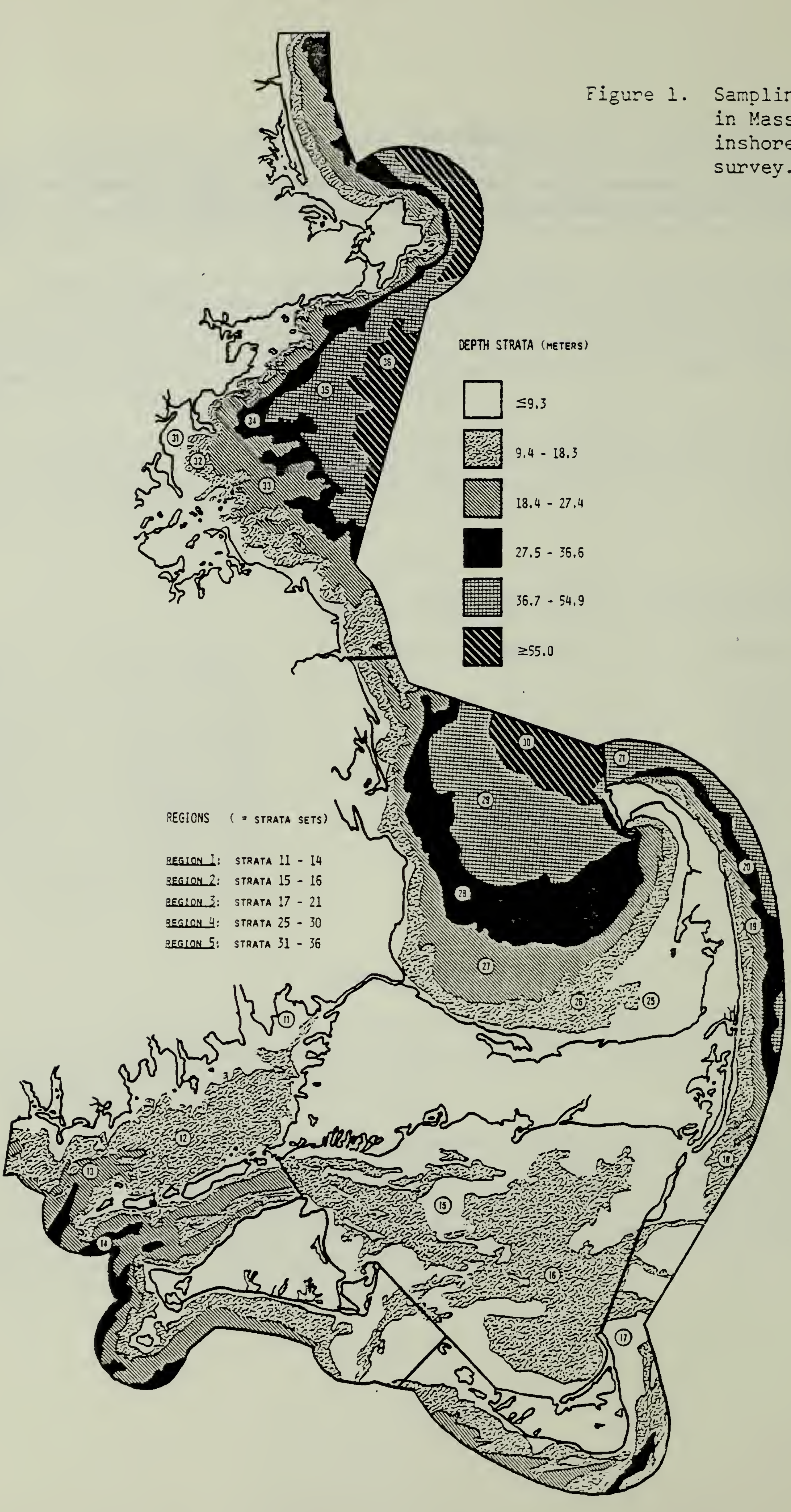

Figure 1. Sampling strata used in Massachusetts DMF inshore bottom trawl survey.

Table 1. Allotment of sampling effort to Massachusetts inshore strata, 1984 survey cruises.

Region	Stratum	Depth Range		Area	Number Stations	
	No.*	Meters	Feet	(sq n mi)	Spring	Autumn
1. Buzzards Bay Vineyard Sound and coastal water south of Martha's Vineyard	11	< 9.3	< 30	102	5	5
	12	9.4-18.3	31- 60	160	8	8
	13	18.4-27.4	61- 90	88	4	4
	14	27.5-36.6	91-120	16	2	2
2. Nantucket Sound	15	< 9.3	< 30	190	10	9
	16	9.4-18.3	31- 60	212	11	10
3. East of Cape Cod, Race Point to Muskeget Island	17	< 9.3	< 30	85	4	4
	18	9.4-18.3	31- 60	88	4	4
	19	18.4-27.4	61- 90	39	2	2
	20	27.5-36.6	91-120	24	2	3
	21	36.7-54.9	121-180	40	2	2
4. Cape Cod Bay	25	< 9.3	< 30	47	3	3
	26	9.4-18.3	31- 60	87	5	5
	27	18.4-27.4	61- 90	94	5	5
	28	27.5-36.6	91-120	93	5	5
	29	36.7-54.9	121-180	103	5	5
	30	>55.0	>181	32	2	2
5. Massachusetts Bay north to New Hampshire border	31	< 9.3	< 30	41	2	3
	32	9.4-18.3	31- 60	49	3	2
	33	18.4-27.4	61- 90	78	3	2
	34	27.5-36.6	91-120	38	3	2
	35	36.7-54.9	121-180	174	5	4
	36	>55.0	>181	33	4	3

* Sampling strata begin with #11 to coordinate with Rhode Island survey design. Strata #22-24 have been allotted to Nantucket Shoals should survey coverage be eventually extended seaward.

Table 2. Summary of 1984 Massachusetts Division of Marine Fisheries bottom trawl survey cruise effort and collections, Massachusetts territorial waters.

	Cruise 8491	Cruise 8492
Vessel	R/V GLORIA MICHELLE	R/V GLORIA MICHELLE
Date	7 May - 22 May	10 Sept. - 27 Sept.
Sampling days	16	18
Stations completed	99	94
Tows aborted	5	4
Mean tow distance and range (n mi)	0.84 (0.71-0.92)	0.81 (0.42*-0.92)
Vessel hours	185.5	212
DMF participants	21	17
Scientific man-hrs at sea	579.5	613.0
Number species caught	63	91
Mean no. species/tow and range	16 (9-28)	17 (4-33)
Total catch weight (kg)	21,200.1	13,592.7
Total catch number	80,264	298,013
Collections completed:		
Age, growth and maturity samples	1,084	696
Age and growth specimens	419	199
Pathobiological observations	5,631	2,811
Special samples	1,714	520

* Denotes tow duration of less than 20 minutes

Table 3. Weight (kilograms) and number for species collected during the 1984 spring and autumn bottom trawl surveys, Massachusetts territorial waters.

Species	Spring		Autumn	
	Wt.	No.	Wt.	No.
Ocean pout	4,447.8	7,674	59.9	178
Winter skate	4,243.9	2,859	1,425.1	685
Winter flounder	1,494.3	4,983	565.9	1,890
Spiny dogfish	1,190.9	657	21,631.0	12,730
Tautog	989.7	677	99.3	75
Little skate	985.5	1,765	758.1	1,283
Longhorn sculpin	634.9	5,032	49.6	461
Silver hake	457.4	2,613	135.0	838
Windowpane	389.9	1,309	72.3	318
Yellowtail flounder	377.2	1,494	57.1	320
Atlantic cod	370.3	619	6.5	489
Northern searobin	366.5	1,627	68.2	522
Scup	343.9	890	1,102.7	86,922
American plaice	272.5	2,946	119.4	1,158
Longfin squid	232.5	3,314	182.8	13,510
Red hake	224.2	1,051	265.5	845
Sea raven	107.5	105	20.6	39
American lobster	106.0	338	324.7	1,647
Goosefish	78.8	14	116.9	25
Rock crab	76.4	516	249.0	2,065
Sand lance	69.1	6,426	.5	84
Smooth dogfish	65.6	20	395.2	718
Fourspot flounder	65.3	318	26.4	148
Atlantic herring	56.6	1,107	76.8	646
Moonsnail	53.5	525	74.5	675
Spider crab	47.1	267	30.0	322
Witch flounder	41.6	72	14.7	23
Alewife	40.0	851	9.3	151
Summer flounder	38.8	30	80.5	83
Black sea bass	35.6	84	80.4	10,219
Wolffish	35.4	7	--	--
Snakeblenny	35.4	784	.4	15
Butterfish	26.5	256	137.7	7,188
Cunner	16.1	115	2.2	53
Channeled whelk	15.6	60	17.8	62
Sea scallop	15.1	50	22.6	161
Haddock	14.1	17	.2	1
Knobbed whelk	11.8	34	20.4	42
Thorny skate	9.3	24	21.5	20
Horseshoe crab	8.3	5	29.9	21
Blueback herring	7.5	285	1.0	26
Mackerel	6.8	8	--	--

Species	Spring		Autumn	
	Wt.	No.	Wt.	No.
Mussel, unclassified	5.7	40	3.4	54
White hake	4.7	92	4.7	51
Lumpfish	4.0	1	.0	1
Daubed shanny	3.7	606	.0	15
Lady crab	3.2	31	51.9	859
Fourbeard rockling	2.6	35	1.4	26
Jonah crab	1.7	10	27.6	174
Ocean quahog	1.6	8	3.7	16
Wrymouth	1.5	1	6.1	5
American shad	1.5	16	.9	10
Striped searobin	1.5	3	3.4	15
Surf clam	1.1	4	.2	2
Pollock	.8	7	.1	1
Bay scallop	.6	9	1.6	21
Oyster toadfish	.6	1	--	--
Quahog	.4	2	.1	1
Menhaden	.3	1	.2	1
Atlantic tomcod	.2	1	--	--
Alligatorfish	.1	36	.0	1
Blue crab	.1	1	1.7	7
Grubby	.0	1	--	--
Rock gunnel	.0	9	--	--
Pipefish	.0	1	.0	7
American eel	.0	1	--	--
Gulfstream flounder	.0	1	.0	3
Octopus, unclassified	.0	3	--	--
Rainbow smelt	.0	2	.3	7
Bluefish	--	--	24.4	136
Atlantic torpedo	--	--	20.2	1
Spotted hake	--	--	1.9	14
Hogchoker	--	--	1.3	6
Northern kingfish	--	--	1.3	10
Rough scad	--	--	1.0	31
Shortfin squid	--	--	.9	11
Round herring	--	--	.8	15
Mackerel scad	--	--	.7	136
Atlantic moonfish	--	--	.3	32
Northern puffer	--	--	.3	20
Banded rudderfish	--	--	.3	1
Short bigeye	--	--	.3	14
Striped anchovy	--	--	.2	104
Bigeye	--	--	.1	6
Bigeye scad	--	--	.1	1
Guaguanche	--	--	.1	5
Weakfish	--	--	.0	8
Moustache sculpin	--	--	.0	1
Red goatfish	--	--	.0	1
Planehead filefish	--	--	.0	4
Total	18,141.1	52,751	28,513.1	148,972

APPENDIX TABLE 1. Average bottom temperature (°C) by depth interval and region, Massachusetts inshore bottom trawl surveys, spring and autumn, 1984.

SPRING

Depth (m)

Region	<9.3	9.4-18.3	18.4-27.4	27.5-36.6	36.7-54.9	>55.0	Mean	Range
1	12.1	11.0	10.6	10.0			11.1	9.3-12.5
2	12.3	11.9					12.1	10.2-13.5
3	9.3	9.6	9.6	5.2	4.5		8.2	4.5-11.3
4	7.6	8.1	4.8	4.5	4.1	4.0	5.5	3.9-10.7
5	7.3	6.6	5.2	5.1	4.9	4.8	5.5	4.5- 7.8

AUTUMN

Depth (m)

Region	<9.3	9.4-18.3	18.4-27.4	27.5-36.6	36.7-54.9	>55.0	Mean	Range
1	18.6	18.5	17.2	14.7			17.8	14.2-20.3
2	18.6	18.6					18.6	15.6-19.7
3	15.4	15.5	13.9	8.2	7.2		12.7	7.0-19.0
4	15.4	13.0	10.0	8.8	6.9	6.4	10.1	6.3-17.8
5	10.0	9.0	7.4	7.5	7.5	7.4	8.1	6.7-10.7

APPENDIX TABLE 2. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of ALL SPECIES for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	176.01	112.91 - 239.11	833.07	492.91 - 1173.23	0.21
1979	169.16	139.08 - 119.25	718.70	524.56 - 912.83	0.24
1980	161.70	113.80 - 209.61	1099.83	426.90 - 1772.76	0.15
1981	258.11	214.64 - 301.58	1220.09	971.43 - 1468.74	0.21
1982	244.09	151.65 - 336.53	2010.07	110.34 - 3909.81	0.12
1983	221.71	167.05 - 276.37	849.05	520.92 - 1177.19	0.26
1984	183.69	145.51 - 221.87	533.66	419.49 - 647.82	0.34

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./No.
1978	315.38	135.23 - 495.53	3310.90	2279.92 - 4341.88	0.10
1979	139.74	101.91 - 177.58	2029.87	1604.97 - 2454.77	0.07
1980	120.04	90.12 - 149.96	2711.74	2019.01 - 3404.48	0.04
1981	134.50	71.30 - 197.71	2517.17	507.91 - 4526.42	0.05
1982	295.90	83.36 - 508.44	4201.31	2270.81 - 6131.79	0.07
1983	135.24	84.82 - 185.66	3303.79	1824.59 - 4783.00	0.04
1984	193.76	119.98 - 267.55	1457.56	1079.41 - 1835.70	0.13

APPENDIX TABLE 3. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of ATLANTIC COD for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	5.63	3.66 - 7.59	45.67	21.34 - 70.00	0.12
1979	9.85	3.15 - 16.56	54.12	23.71 - 84.53	0.18
1980	9.08	6.07 - 12.10	39.63	27.33 - 51.94	0.23
1981	10.22	3.62 - 16.82	50.35	32.63 - 68.07	0.20
1982	7.42	4.17 - 10.67	22.10	14.46 - 29.75	0.34
1983	10.28	5.61 - 14.95	32.19	21.22 - 43.16	0.32
1984	4.18	2.30 - 6.06	6.81	3.80 - 9.82	0.61

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.47	* - 3.52	76.25	28.19 -124.32	0.02
1979	0.50	0.06 - 0.94	4.04	1.67 - 6.41	0.12
1980	0.75	0.17 - 1.33	7.11	2.57 - 11.65	0.11
1981	3.06	* - 6.72	7.80	* - 15.66	0.39
1982	0.62	* - 1.70	3.72	0.24 - 7.19	0.17
1983	0.08	* - 0.19	1.03	0.34 - 1.72	0.08
1984	0.08	* - 0.18	5.77	2.04 - 9.50	0.01

APPENDIX TABLE 4.

ATLANTIC COD :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3									.468	4.925
4			.467	.034					2.706	13.100
5	.531	.048	1.654	.069	.094				1.408	1.933
6	.291	.288	.899	.103	.113				.383	
7	.060	.047	.150							
8										.200
9										
10										.046
11					.094					
12			.072		.031					.046
13					.463					
14			.145	.035	.063					.094
15					.031					.046
16			.145		.346					
17			.290		.124					
18			.145		.293					
19			.217		.147					
20			.217		.645					.105
21			.333	.041	.294					.046
22			.580		.329					
23			.478		.461					
24			.304		.680					.105
25	.022		.217		.334					
26	.022		.188		.690					
27	.022		.290		.651					.105
28	.022		.145		.684					.046
29	.022			.045	.901					.105
30					.458					
31				.041	1.092					
32				.035	1.161					.105
33			.072		.676			.072		.105
34					1.145					
35				.041	1.557					
36			.072	.041	1.127					
37				.045	.447					
38				.086	.499					
39				.041	.545					
40				.086	.626					.046
41			.130		.293					
42				.041	.227					
43				.045	.144					
44			.043	.041	.302					
45				.045	.331					
46				.041	.320					
47				.169	.253					
48				.045	.249					

APPENDIX TABLE 4 CONT.

ATLANTIC COD :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49				.082	.176					
50			.043	.083	.695					
51				.082	.316					
52				.045	.269					
53			.043	.045	.713					
54			.072	.041	.270					
55			.087	.045	.124					
56				.082	.089					
57				.075	.124					
58				.082	.084					
59				.038	.253					
60			.043	.082	.185					.027
61										
62			.080		.063					
63			.043		.063					
64					.104					
65				.082						
66										
67										
68					.169					
69					.040					
70					.061					
71					.084					
72										
73			.043							
74										
75										
76										
77										
78										
79										
80										
81										
82										
83										
84										
85					.084					
TOTAL:	0.991	0.383	7.715	2.038	22.884			0.072	4.965	21.186
AVE.IN:	7.84	6.00	17.76	42.46	35.27			33.00	4.34	4.93

APPENDIX TABLE 5. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of HADDOCK for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.27	0.02 - 0.53	0.46	0.04 - 0.87	0.60
1979	0.02	* - 0.04	0.12	* - 0.28	0.15
1980	0.27	0.11 - 0.44	2.12	0.75 - 3.49	0.13
1981	0.25	0.07 - 0.43	1.94	0.59 - 3.29	0.13
1982	0.02	* - 0.05	0.03	* - 0.06	0.69
1983	0.34	0.06 - 0.63	1.70	0.82 - 2.58	0.20
1984	0.19	* - 0.52	0.24	* - 0.62	0.80

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.00	0.00	0.01	* - 0.02	0.00
1979	0.06	0.04 - 0.08	7.19	4.43 - 9.94	0.01
1980	0.16	0.05 - 0.28	7.83	2.56 - 13.09	0.02
1981	0.14	* - 0.33	0.52	* - 1.11	0.27
1982	0.11	0.01 - 0.21	13.38	0.03 - 26.72	0.01
1983	0.01	* - 0.02	0.40	* - 0.82	0.02
1984	0.00	* - 0.01	0.01	* - 0.03	0.20

*Negative lower limit.

APPENDIX TABLE 6.

HADDOCK :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20					.084					
21										
22										
23										
24					.020					
25										
26								.072		
27										
28										
29					.020					
30										
31										
32										
33										
34										
35										
36					.337					
37										
38										
39					.188					
40					.084					
41										
42										
43					.084					
44										
45										
46										
47										
48										

APPENDIX TABLE 6 CONT.

HADDOCK :

Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	R E G I O N S									
CMS	1	2	3	4	5	1	2	3	4	5
49										
50										
51					.020					
52										
53					.084					
54										
55										
56					.084					
57										
58										
59										
60					.104					
TOTAL:					1.111			0.072		
AVE.IN:					41.12			26.00		

APPENDIX TABLE 7. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of SILVER HAKE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.63	0.24 - 1.02	4.85	2.70 - 7.00	0.13
1979	1.89	* - 3.92	7.72	3.02 - 12.41	0.24
1980	1.54	* - 3.13	10.65	3.63 - 17.67	0.14
1981	1.76	0.60 - 2.93	15.34	5.89 - 24.79	0.12
1982	0.31	0.17 - 0.45	3.47	2.20 - 4.74	0.09
1983	2.41	1.26 - 3.55	20.38	8.98 - 31.77	0.12
1984	3.68	1.24 - 6.12	19.65	6.72 - 32.59	0.19

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.86	0.75 - 2.98	45.38	19.16 - 71.60	0.04
1979	3.11	2.16 - 4.05	41.74	32.93 - 50.55	0.07
1980	3.27	0.81 - 5.74	34.62	17.56 - 51.69	0.09
1981	3.61	2.41 - 4.82	27.60	18.69 - 36.51	0.13
1982	1.95	1.46 - 2.43	42.42	28.57 - 56.28	0.05
1983	1.82	1.46 - 2.19	20.93	16.64 - 25.22	0.09
1984	1.18	0.85 - 1.52	7.86	6.15 - 9.57	0.15

*Negative lower limit.

APPENDIX TABLE 8.

SILVER HAKE :

Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5							.475			
6					.120		.053			
7					.020	.055				
8					.308	.022				
9	.197				.244	.109				
10	1.284			.169	.737	.055				
11	1.612		.080	.275	.956	.164	.475			
12	.962		.141	.446	.788					
13	.913			.410	.739				.041	
14	.803			.372	.704				.324	.094
15	.410		.043	.131	.384			.029	.250	.140
16	.568			.041	.244			.159	.532	.305
17	.546			.086				.159	.991	.073
18	.109				.020			.203	.869	.343
19	.224							.377	1.823	.378
20	.279			.136	.020			.174	1.419	.495
21	.257			.162	.060			.145	1.279	.448
22	.361			.450	.020	.022		.116	.805	.791
23	.525		.072	.456	.040				.575	.317
24	1.071		.116	.379	.104			.029	.448	.185
25	4.109	.048	.145	.583	.020			.072	.494	.344
26	5.016	.048		.359	.184				1.491	.768
27	8.388	.192	.261	.484	.020				1.488	.505
28	10.126	.048		.429	.060				2.115	1.300
29	10.186	.288	.217	.599	.060			.072	1.372	.638
30	8.120	.192	.143	.609	.040				1.261	1.299
31	6.934	.192	.072	.289	.040				.800	.320
32	5.077	.144	.220	.533	.040				.583	.637
33	3.361	.144	.216	.262	.040				.332	.266
34	2.404			.383					.338	.238
35	1.082	.096	.071	.258					.331	.027
36	1.634	.048	.072	.172	.060				.162	.053
37	1.251		.071	.172	.020				.166	.212
38	.683	.048	.072	.398	.124				.090	.080
39	.503		.071	.041	.020				.041	.133
40	.399			.086	.060				.090	.080
41	.060		.071	.045					.171	.027
42	.235									
43				.086						.053
44	.164								.115	.053
45	.115			.176					.045	.053
46	.060			.041					.045	.053
47				.086	.020				.041	
48	.060			.131					.035	

APPENDIX TABLE 8 CONT.

SILVER HAKE :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49										.027
50				.045	.020					.080
51										.027
52										
53				.041						
54										
55										.027
TOTAL:	80.087	1.486	2.155	9.821	6.335	0.426	1.002	1.536	20.965	10.868
AVE.IN:	27.99	30.45	28.51	26.93	14.97	10.26	7.89	19.65	25.16	27.18

APPENDIX TABLE 9. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of RED HAKE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	3.40	* - 7.70	11.12	* - 26.00	0.31
1979	11.85	* - 27.02	33.71	* - 74.54	0.35
1980	3.03	1.24 - 4.81	16.00	2.62 - 29.38	0.19
1981	12.01	* - 28.46	34.77	2.06 - 67.48	0.34
1982	2.86	* - 5.80	7.30	1.26 - 13.34	0.39
1983	3.16	1.51 - 4.82	14.46	7.17 - 21.74	0.22
1984	1.70	0.87 - 2.54	9.33	4.12 - 14.53	0.18

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	2.57	1.83 - 3.31	8.31	5.47 - 11.14	0.31
1979	2.75	1.84 - 3.66	12.77	6.66 - 18.88	0.22
1980	3.44	1.77 - 5.10	18.09	7.44 - 28.73	0.19
1981	6.12	3.68 - 8.57	32.87	19.93 - 45.80	0.19
1982	3.42	2.32 - 4.51	17.95	12.84 - 23.06	0.19
1983	5.68	3.22 - 8.14	26.85	13.78 - 39.93	0.21
1984	2.40	1.61 - 3.20	8.23	5.66 - 10.80	0.29

*Negative lower limit.

APPENDIX TABLE 10.

RED HAKE :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8				.038						
9				.038	.084					
10				.241	.020					
11	.180		.072	.354	.526					
12	1.148			.851	.754					
13	1.525			.985	.437					
14	2.399			1.093	.437					.362
15	2.022			.885	.357					.316
16	1.455			.693	.020				.086	.343
17	.880			.689	.020				.123	.737
18	.284			.500	.060	.055		.145	.247	.737
19	.115			.627	.188			.145	.665	.211
20	.160		.072	.441	.104			.145	1.069	.343
21				.176				.290	.874	.151
22	.044			.197	.084	.022		.435	1.124	.099
23	.066			.259	.104			.145	.462	
24			.072	.163	.020			.072	.462	.151
25			.072	.476	.020	.044		.145	.419	.178
26	.066		.072	.625	.020	.087		.072	.258	.073
27	.104			.537	.188	.044		.290	.555	.046
28	.044		.072	.531	.020	.022		.145	.597	.165
29	.044		.072	.695	.377	.044		.145	.778	.073
30	.372		.072	.539	.397	.022			.873	.107
31	.492			.493	.253			.145	.876	.132
32	.836			.405	.164			.145	1.535	.053
33	1.149			.283	.104	.022		.072	1.623	.133
34	1.200		.116	.217	.184				1.032	.107
35	1.230			.289	.293			.072	1.350	.286
36	1.226			.324	.104			.072	1.538	.373
37	1.007			.203	.040				.981	.293
38	.718		.143	.173	.188				1.252	.240
39	.881			.168	.144				.997	.320
40	.329		.143	.363	.120				.950	.186
41	.126			.164	.020			.072	.668	.186
42	.148			.246	.040				.748	.186
43	.109				.144			.072	.877	.107
44	.060			.205				.072	.799	.107
45	.126		.072	.258	.020				.238	.133
46	.120			.173	.031				.415	.053
47				.041	.020				.344	.107
48	.044			.164					.082	.053

APPENDIX TABLE 10 CONT.

RED HAKE :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	R E G I O N S									
CMS	1	2	3	4	5	1	2	3	4	5
49	.044			.041					.121	.027
50			.071	.086					.117	.107
51			.072	.123					.357	
52									.041	
53				.082					.041	
54									.041	.027
55				.086					.117	
56									.076	
57										
58										
59										
60										.027
61										
62									.045	
TOTAL:	20.746		1.197	16.218	6.107	0.361		2.899	25.850	7.332
AVE.LN:	25.20		33.05	24.77	23.31	25.70		26.40	33.43	28.09

APPENDIX TABLE 11. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of WHITE HAKE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.95	* - 2.23	4.23	0.34 - 8.12	0.22
1979	0.34	* - 0.77	2.23	0.82 - 3.65	0.15
1980	0.12	0.04 - 0.20	2.29	0.54 - 4.04	0.05
1981	0.28	0.12 - 0.44	4.79	2.69 - 6.89	0.06
1982	0.03	0.01 - 0.06	0.44	0.13 - 0.74	0.07
1983	0.12	0.01 - 0.22	1.33	0.53 - 2.13	0.09
1984	0.04	* - 0.11	1.03	* - 2.50	0.04

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.80	0.55 - 1.05	13.72	9.68 - 17.76	0.06
1979	0.78	0.44 - 1.12	7.25	4.42 - 10.09	0.11
1980	1.01	0.71 - 1.31	12.91	9.40 - 16.43	0.08
1981	0.97	0.54 - 1.40	10.34	5.04 - 15.64	0.09
1982	0.60	0.30 - 0.90	5.48	2.42 - 8.54	0.11
1983	0.32	0.20 - 0.45	1.82	1.17 - 2.47	0.18
1984	0.05	0.01 - 0.08	0.57	0.14 - 1.00	0.08

*Negative lower limit.

APPENDIX TABLE 12.

WHITE HAKE :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4		.047								
5										.059
6										
7	.172									
8	.111									
9										
10										
11	.472									
12	.421									
13	1.296									
14	.824									
15	.939					.056		.077		
16	.412							.077		
17	.295							.077		
18	.056					.056				
19	.056									.138
20						.111		.077		.294
21						.056		.077	.041	.046
22									.086	.138
23									.124	.138
24	.056					.111			.086	.381
25						.056				.138
26									.086	
27										
28										
29										
30									.045	
31										
32										
33									.082	
34									.041	
35										
36										
37										
38	.060									
39	.060									
40										
41	.060									
42										
43										
44										
45										
46	.022									
TOTAL:	5.311	0.047				0.446		0.385	0.591	1.333
AVE.IN:	14.67	4.00				20.88		17.80	25.97	21.44

APPENDIX TABLE 13. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of SCUP for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	17.81	* - 46.30	50.48	* -123.22	0.35
1979	9.63	0.25 - 19.00	40.65	3.44 - 77.86	0.24
1980	22.95	* - 65.18	104.74	* -284.58	0.22
1981	9.48	2.28 - 16.67	159.41	27.72 -291.10	0.10
1982	0.53	0.01 - 1.04	5.66	0.04 - 11.27	0.09
1983	1.80	0.29 - 3.30	12.98	1.23 - 24.74	0.14
1984	3.55	0.42 - 6.67	9.25	2.08 - 16.42	0.38

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	14.26	9.42 - 19.11	1797.25	1026.82-2567.68	0.01
1979	11.38	7.92 - 14.84	1088.63	746.06-1431.21	0.01
1980	12.08	8.77 - 15.39	1141.45	792.69-1490.21	0.01
1981	13.51	6.42 - 20.60	911.16	258.59-1563.73	0.02
1982	8.61	4.63 - 12.59	2021.63	630.46-3394.80	< 0.01
1983	13.98	6.09 - 21.86	1669.54	765.55-2573.52	0.01
1984	11.54	7.77 - 15.31	907.16	612.46-1201.85	0.01

*Negative lower limit.

APPENDIX TABLE 14.

SCUP :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

R E G I O N S

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3						1.967				
4						.334			.069	
5						45.101	38.973		.137	
6						614.157	412.126	9.403	.309	
7						939.751	441.946	52.077	3.367	
8						652.597	543.515	168.898	2.233	
9						124.281	326.820	68.710	.172	
10						2.963	40.445	10.123	.103	
11						.056	.053		.069	
12						2.296			.034	
13	.191					15.014	.105			
14						46.208	.737			
15	.055	.095				38.991	7.115			
16	.605	.144				4.932	9.541			
17	2.114	.905				1.213	1.686			
18	2.859	.668				.055	.211			
19	2.768	.812				.166				
20	2.170	.286				.737	.158			
21	1.662	.332				.910	.632			
22	3.160	.379				.546	.211			
23	3.243	.759				.220	.105			
24	3.996	.473				.169	.158			
25	3.334	.475				.275				
26	3.501	1.040				.548				
27	2.113	.756				.713				
28	1.558	.426				.437				
29	.446	1.276				.548				
30	.667	.756				.437				
31	.166	.709				.275				
32	.167	.520				.055				
33		.284				.109				
34		.284				.169				
35	.056	.236								
36	.056	.520								
37	.056									
38										
39										
40										
41	.056									
TOTAL:	34.998	12.135				2496.230	1824.536	309.211	6.493	
AVE.IN:	22.80	25.71				7.44	7.56	8.06	7.39	

APPENDIX TABLE 15. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of BLACK SEA BASS for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.37	* - 0.77	1.12	* - 2.82	0.33
1979	0.40	0.10 - 0.69	0.54	0.17 - 0.91	0.74
1980	0.43	0.13 - 0.73	0.54	0.16 - 0.93	0.79
1981	0.71	0.32 - 1.11	1.19	0.52 - 1.86	0.60
1982	0.49	0.27 - 0.71	1.18	0.59 - 1.77	0.42
1983	0.76	0.21 - 1.30	2.35	0.56 - 4.14	0.32
1984	0.37	0.15 - 0.59	0.87	0.36 - 1.38	0.42

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.48	0.18 - 0.78	43.77	* - 95.96	0.01
1979	0.61	0.32 - 0.91	40.71	1.33 - 80.09	0.02
1980	0.55	0.24 - 0.85	52.37	18.53 - 86.22	0.01
1981	0.17	0.08 - 0.26	34.86	6.99 - 62.74	0.01
1982	0.81	0.47 - 1.15	217.34	69.44 -365.23	> 0.01
1983	0.64	0.16 - 1.12	117.50	* -246.44	0.01
1984	0.88	* - 1.94	110.38	* -251.29	0.01

*Negative lower limit.

APPENDIX TABLE 16.

BLACK SEA BASS :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3						.721				
4						32.162	.053			
5						115.985	23.059			
6						69.195	92.376			
7						10.932	97.262	.231		
8						1.826	71.948			
9							24.840			
10							2.888			
11							.053			
12										
13										
14										
15							.315			
16							.525			
17							.053			
18										
19										
20	.060	.048								
21	.169		.077							
22	.164	.190								
23	.285	.238	.150							
24	.402	.238					.053			
25	.278									
26										
27	.166	.047							.069	
28							.158			
29	.022	.047	.150				.053			
30	.169	.190					.264			
31	.060	.047					.053			
32	.056	.190					.158			
33		.096					.105			
34	.280						.053			
35		.095				.055	.053			
36	.056		.077				.053			
37		.048					.053			
38		.048					.053			
39							.105			
40	.056	.047					.105	.077		
41		.047								
42								.077		
43		.047								
44	.056									
45										
46							.053			
47										
48										

APPENDIX TABLE 16 CONT.

BLACK SEA BASS :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
49										
50										
51										
52		.048								
53										
54										
55										
56										
57										
58										
59		.048								
TOTAL:	2.279	1.760	0.455			230.875	314.740	0.385	0.069	
AVE.LN:	27.02	30.38	26.85			5.28	7.11	20.60	27.00	

APPENDIX TABLE 17. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of TAUTOG for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	4.48	0.88 - 8.09	2.36	0.55 - 4.17	1.90
1979	5.16	1.54 - 8.78	2.89	1.02 - 4.77	1.78
1980	4.13	1.25 - 7.01	1.91	0.64 - 3.18	2.17
1981	2.86	1.38 - 4.34	2.16	1.00 - 3.31	1.33
1982	5.94	1.86 - 10.01	3.70	1.04 - 6.36	1.60
1983	5.24	1.18 - 9.30	2.96	0.79 - 5.14	1.77
1984	10.40	* - 23.90	7.14	* - 16.88	1.46

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.72	0.05 - 1.39	0.46	0.06 - 0.87	1.56
1979	0.57	0.19 - 0.95	1.57	* - 3.24	0.36
1980	1.05	0.24 - 1.86	4.50	* - 9.95	0.23
1981	0.79	0.12 - 1.47	0.96	0.36 - 1.56	0.83
1982	0.70	* - 1.52	0.65	0.14 - 1.16	1.07
1983	0.27	0.04 - 0.49	0.99	0.16 - 1.82	0.27
1984	1.09	* - 2.40	0.75	0.16 - 1.33	1.46

*Negative lower limit.

APPENDIX TABLE 18.

TAUTOG :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	R E G I O N S									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5									.172	
6									.034	
7									.172	
8									.172	
9						.056			.069	
10	.055									
11										
12										
13										
14	.167					.055				
15	.055								.034	
16							.053			
17	.223								.076	
18							.053			
19	.223						.053		.069	
20	.055			.034		.055				
21	.110	.047					.053		.034	
22	.055	.047					.053			
23							.053		.034	
24	.389									
25	.223									
26	.222	.047				.055				
27	.502	.047								
28	.892	.048				.055				
29	.725									
30	.778									
31	1.000	.095				.056			.034	
32	1.784	.047				.056				
33	.333			.034		.055	.053			
34	.948	.142				.055	.053		.034	
35	1.169	.189								
36	1.279	.142				.056				
37	2.174	.047		.034		.056				
38	1.672	.095		.034					.034	
39	2.062	.095								
40	1.839	.095								
41	.780			.038		.056				
42	1.672	.142				.060				
43	.723	.047				.060				
44	1.504	.095				.056				
45	.946	.047		.034		.060				
46	1.003	.142		.069	.050	.060				
47	1.338	.190		.034		.120				
48	.502	.143		.034		.060				

APPENDIX TABLE 18 CONT.

TAUTOG :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49	.892	.047		.073		.176				
50	1.281	.237				.116				
51	1.393	.095		.034		.176				
52	.111	.047							.034	
53	.780					.060				
54	.390					.060				
55	.502	.095				.175				
56	.056									
57	.223	.095				.056				
58	.279			.034						
59	.056	.047		.034		.055				
60		.143				.120				
61										
62										
63										
64										
65										
66	.167									
67										
68										
69						.060				
TOTAL:	33.531	2.796		0.523	0.050	2.192	0.421		1.003	
AVE.IN:	39.73	42.84		44.47	46.00	44.52	23.25		14.16	

APPENDIX TABLE 19. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of OCEAN POUT for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	21.10	8.72 - 33.48	45.88	25.01 - 66.74	0.46
1979	22.82	15.88 - 29.76	44.80	29.93 - 59.68	0.51
1980	16.13	10.43 - 21.84	28.70	17.87 - 39.54	0.56
1981	35.04	24.58 - 45.50	62.43	42.12 - 82.73	0.56
1982	35.29	20.02 - 50.56	51.18	32.17 - 70.18	0.69
1983	49.36	33.42 - 65.30	65.30	46.49 - 84.11	0.76
1984	44.94	24.80 - 65.09	79.14	40.26 -118.03	0.57

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.48	0.88 - 2.08	18.66	10.08 - 27.23	0.08
1979	2.15	1.35 - 2.95	25.05	14.97 - 35.14	0.09
1980	1.92	0.64 - 3.21	13.94	4.76 - 23.12	0.14
1981	1.91	0.77 - 3.06	6.67	3.05 - 10.28	0.29
1982	3.51	1.42 - 5.60	20.43	8.99 - 31.86	0.17
1983	2.14	1.04 - 3.25	12.52	4.94 - 20.10	0.17
1984	0.67	0.22 - 1.12	2.17	1.10 - 3.24	0.31

APPENDIX TABLE 20.

OCEAN POUT :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	R E G I O N S									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6				.156						
7				.658						
8				.038						
9				.038						
10			.362						.080	.138
11								.072	.136	.276
12			.725						.045	.230
13			2.899					.072	.222	.046
14			3.551	.127				.072	.244	
15			3.188						.164	
16			1.449	1.117					.041	
17			1.449	1.993	.020				.090	
18	.022		.072	1.308	.084					
19			.362	1.941					.045	
20			.072	1.150	.253				.172	
21			1.159	1.519	.789			.145	.127	.132
22			.725	1.481	.785				.131	.105
23	.022		1.449	2.654	.745				.129	.151
24			1.449	1.702	.512				.082	.027
25			.362	2.857	1.007					.283
26			.725	3.006	.710				.045	.421
27			1.812	2.249	.875				.045	.389
28				4.464	1.499					.316
29			.362	3.558	.958				.045	.527
30	.022		1.087	5.878	1.271				.045	.343
31			1.087	2.540	1.812					.105
32			1.087	3.652	3.179					
33			1.087	3.365	2.334					
34			.725	6.241	2.578				.035	.185
35			.725	4.581	2.071				.045	.132
36	.060		.362	3.177	1.815					.211
37	.022		.362	3.950	2.406			.072	.045	.264
38	.109		.725	4.118	2.520					.027
39	.066		1.449	3.009	2.469			.072		
40	.022		.362	3.887	2.255					
41	.044		.725	3.058	3.690				.045	.159
42	.066		1.449	5.621	2.718				.080	.185
43	.022		1.087	2.831	1.847				.045	.027
44	.148		.725	4.189	4.263				.131	.027
45	.104		.797	4.944	2.950				.041	.132
46	.109		.725	4.533	2.691				.045	.027
47			1.493	5.152	3.937				.045	
48	.044		.697	6.834	2.577				.181	.211

APPENDIX TABLE 20 CONT.

OCEAN POUT :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49	.120		.882	4.018	2.694				.080	.027
50	.120		1.165	8.031	3.363				.125	
51	.044		.656	5.610	1.890				.131	
52			1.210	5.086	2.816				.080	
53	.082		1.389	7.302	3.019					
54	.044		.467	5.537	1.131				.041	
55	.044		.654	5.705	2.553				.045	.105
56			.768	5.423	2.634				.136	
57	.022		2.288	5.236	1.765				.136	
58	.060		2.138	5.559	1.257					
59	.044		2.361	3.186	.707				.041	
60	.044		1.239	9.478	.828				.045	
61			2.060	3.678	.963			.072	.080	
62			1.788	3.007	.728				.045	
63			1.230	2.418	.274					
64			1.887	3.529	.272					
65			1.895	1.684	.547					
66			1.378	1.634	.328					
67	.022		.601	1.225						
68			2.009	1.655	.203				.041	
69			1.091	.542	.080					
70			1.514	1.770	.040				.045	
71			.344	.704	.129				.086	
72			.574	.256	.099					
73			.795	.544	.173					
74			.080	.129	.020				.045	
75			.435	.457	.208				.041	
76	.044		.362	.045					.045	
77			.599							
78			.071	.580					.041	
79				.038						
80			.150						.045	
81			.141							
82			.080							
83			.072							
84			.071	.211					.041	
85										
86										
87										
88										
89			.071	.038						
90										
91			.080							
92			.071							
93			.080							
94			.072							
95										
96										

APPENDIX TABLE 20 CONT.

OCEAN POUT :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
97										
98										
99										
100			.071							
TOTAL:	1.568		73.817	207.893	86.340			0.580	4.042	5.206
AVE.LN:	47.09		43.76	45.11	43.50			27.13	37.52	29.47

APPENDIX TABLE 21. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of NORTHERN SEAROBIN for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	14.74	* - 41.02	75.95	* -214.10	0.19
1979	11.81	1.40 - 22.21	64.01	6.81 -121.21	0.18
1980	12.53	0.61 - 24.43	55.37	2.82 -107.92	0.23
1981	29.04	1.57 - 56.50	150.94	15.39 -286.49	0.19
1982	59.39	* -135.31	329.24	* -749.18	0.18
1983	42.99	* - 92.44	256.16	* -567.45	0.17
1984	3.75	1.20 - 6.30	16.67	6.40 - 26.94	0.22

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	3.81	* - 9.12	21.56	2.24 - 40.88	0.18
1979	4.20	* - 8.94	34.57	12.94 - 56.19	0.12
1980	0.97	* - 1.43	19.35	10.99 - 27.71	0.05
1981	0.70	0.07 - 1.33	23.40	* - 47.70	0.03
1982	1.29	0.25 - 2.32	33.12	6.61 - 59.64	0.04
1983	0.84	0.21 - 1.47	17.83	5.41 - 30.24	0.05
1984	0.73	0.18 - 1.28	5.21	1.20 - 9.22	0.14

*Negative lower limit.

APPENDIX TABLE 22.

NORTHERN SEAROBIN :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4									.034	
5						.279				
6						.579				
7						2.511	.211		.034	
8						5.242	.158			
9						2.372	.316			
10						.504	.053		.034	
11	.176					.022				
12	1.055					.055				
13	1.388									
14	.983		.696							
15	.325		.231							
16	.078					.060				
17	.060					.022				
18						.044				
19		.048	.462			.109				
20	.137	.335	.311			.153			.034	
21	.565	.956	.918			.066	.316		.034	
22	.897	1.714	2.001			.153	.369			
23	1.198	1.667	4.668			.131	.422			
24	1.030	2.135	2.311			.055	.263		.038	
25	.838	4.091	3.141	.082		.187	.579	.080		
26	1.059	7.079	3.582			.273	1.052			.033
27	1.278	7.269	2.315	.038		.657	1.420		.038	
28	1.283	6.787	1.699			.273	1.209		.038	
29	.891	5.458	1.575	.038		.385	1.945			
30	.780	4.514	.380			.721	1.261			
31	.579	3.530	.308			.109	.578			
32	.056	1.521	.231	.041		.111	.210			
33	.111	.618	.462				.158			
34		.189				.056	.053			
35	.056	.144	.231							
36	.056					.055				
TOTAL:	14.877	48.054	25.522	0.199		15.183	10.571	0.080	0.286	0.033
AVE.LN:	22.56	27.29	24.82	27.60		12.43	26.18	25.00	17.97	26.00

APPENDIX TABLE 23. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of LONGHORN SCULPIN for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	2.30	1.55 - 3.04	11.93	7.86 - 15.99	0.19
1979	2.63	1.79 - 3.48	17.91	10.04 - 25.78	0.15
1980	1.89	1.43 - 2.35	12.10	8.64 - 15.56	0.16
1981	6.08	4.00 - 8.15	38.67	23.88 - 53.47	0.16
1982	5.69	4.38 - 7.00	36.83	25.53 - 48.12	0.16
1983	6.08	4.04 - 8.13	44.69	19.40 - 69.97	0.14
1984	6.51	4.26 - 8.77	53.70	27.50 - 79.90	0.12

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.26	0.12 - 0.41	4.09	1.43 - 6.74	0.06
1979	1.08	0.61 - 1.54	10.03	5.57 - 14.49	0.11
1980	1.21	0.49 - 1.92	14.49	5.99 - 23.00	0.08
1981	0.70	0.33 - 1.06	4.64	2.15 - 7.13	0.15
1982	1.38	0.71 - 2.04	14.83	6.66 - 23.00	0.09
1983	0.95	0.22 - 1.68	12.04	4.82 - 19.27	0.08
1984	0.62	0.08 - 1.17	6.49	0.23 - 12.75	0.10

APPENDIX TABLE 24.

LONGHORN SCULPIN :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9			.362							
10			.797							
11			.362	.041						
12				.466	.590			.072	.045	
13				.045	2.505			.072	.045	.362
14			.362	.090	5.492				.083	.257
15			1.957	1.019	6.152					.632
16			3.986	2.811	7.320				.123	.994
17			4.130	6.182	9.703			.072	.132	2.047
18			10.739	6.288	9.085				.090	3.627
19			7.984	8.719	8.959			.290	.267	3.323
20			7.304	9.754	10.509			.072	.402	4.157
21	.060		2.278	3.981	8.175			.362	.542	2.301
22	.109	.048	2.328	3.427	12.691			.507	.569	1.763
23	.208		1.486	1.612	12.201			.290		1.923
24	.519		2.314	2.038	11.232			.435	.045	1.553
25	.656	.048	2.109	2.850	10.652			.217	.257	.770
26	1.319	.240	2.294	2.489	7.621			.072	.132	.611
27	.989	.143	2.983	2.904	5.828				.041	.467
28	.426	.048	1.578	2.081	2.543			.217	.115	
29	.345		2.754	1.495	1.503				.086	.140
30	.367	.048	1.370	1.673	.514					.027
31	.508	.096	1.308	.727	.040				.035	
32	.165	.096	.581	.640						
33	.060		.157	.121	.203					
34			.150	.082						
35	.060									
36		.048	.077							
37		.048		.034						
TOTAL:	5.792	0.862	61.750	61.571	133.520			2.681	3.009	24.955
AVE.LN:	27.00	28.61	20.95	21.27	20.94			22.11	21.26	20.09

APPENDIX TABLE 25. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of YELLOWTAIL FLOUNDER for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	6.09	3.62 - 8.56	22.83	12.55 - 33.11	0.27
1979	6.90	4.93 - 8.86	26.42	18.87 - 33.96	0.26
1980	6.01	4.54 - 7.48	19.70	14.55 - 24.85	0.30
1981	9.81	7.34 - 12.27	46.52	31.12 - 61.93	0.21
1982	7.72	5.03 - 10.42	23.71	16.12 - 31.30	0.33
1983	5.45	2.95 - 7.95	16.11	10.10 - 22.11	0.34
1984	4.51	1.94 - 7.08	17.74	7.80 - 27.68	0.25

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.68	0.91 - 2.46	9.95	6.72 - 13.17	0.17
1979	4.47	2.86 - 6.08	29.27	17.92 - 40.63	0.15
1980	3.55	2.42 - 4.67	24.75	16.66 - 32.83	0.14
1981	1.65	0.70 - 2.60	6.83	4.15 - 9.52	0.24
1982	2.52	1.62 - 3.42	13.11	7.23 - 18.99	0.19
1983	2.07	0.79 - 3.34	13.70	4.39 - 23.01	0.15
1984	0.70	0.39 - 1.01	3.79	2.28 - 5.30	0.18

APPENDIX TABLE 26.

YELLOWTAIL FLOUNDER :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										.059
5										.059
6										
7										
8										
9			.080							
10				.118	.031					
11			.072	.041	.133					
12		.048	.072	.038	.094					
13			.362	.041						
14			.116	.034	.031				.079	.151
15				.073	.084			.077	.041	.105
16			.072	.041	.269				.123	.400
17			.433	.082	.368			.072	.330	.094
18			.145	.045	1.488			.101	.493	.094
19			1.054	.214	1.848			.243	.657	.094
20			.435	.382	1.033			.496	1.148	.059
21			1.609	.743	2.136			.071	.822	.059
22			.768	.530	2.443			.241	.564	.105
23			1.734	.984	3.037			.029	.247	.362
24			1.175	.958	1.917			.072	.123	.494
25			1.159	1.236	2.837			.029	.127	.400
26	.120		1.418	1.609	3.048			.201	.252	1.080
27	.060		1.290	1.418	2.191			.145	.127	.187
28			1.292	1.500	1.673			.460	.371	.094
29			1.090	1.450	2.505			.435	.254	.467
30			1.049	1.437	3.554			.362	.370	.218
31	.180		1.215	.771	2.106			.504	.172	.079
32	.180		.584	.704	1.591			.357	.246	.305
33			.471	.374	1.159			.143	.207	.165
34	.060		.825	.645	1.847			.100	.041	.246
35			.350	.335	1.746			.272	.082	.351
36	.180		.535	.599	1.203				.041	.435
37	.120		.265	.304	1.361			.288	.045	
38	.120		.570	.467	.443			.071		.140
39			.425	.218	.332			.071		
40	.060		.154	.253	.735					.105
41	.060		.143	.217	1.068					.105
42			.116	.083	.470					
43			.087	.244	.377					
44			.077	.041	.169					
45			.145		.788					
46				.127	.115					
47				.090	.084					
48			.145		.031					

APPENDIX TABLE 26CONT.

YELLOWTAIL FLOUNDER :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	R E G I O N S									
CMS	1	2	3	4	5	1	2	3	4	5
49										
50					.020					
51										.105
TOTAL:	1.142	0.048	21.531	18.446	46.365			4.840	6.961	6.620
AVE.IN:	33.74	12.00	27.13	28.53	28.32			27.88	23.18	27.14

APPENDIX TABLE 27. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of WINTER FLOUNDER for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	18.70	12.80 - 24.60	62.74	47.50 - 77.97	0.30
1979	16.56	11.13 - 21.98	58.85	42.36 - 75.34	0.28
1980	16.23	11.93 - 20.54	51.34	41.47 - 61.21	0.32
1981	21.50	13.51 - 29.48	70.86	49.53 - 92.18	0.30
1982	14.76	9.78 - 19.74	49.54	34.50 - 64.58	0.30
1983	23.56	17.37 - 29.75	81.76	61.12 -102.41	0.29
1984	15.27	11.46 - 19.07	50.42	38.92 - 61.92	0.30

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	5.46	3.47 - 7.46	25.47	15.82 - 35.13	0.21
1979	13.68	9.13 - 18.22	54.26	36.95 - 71.58	0.25
1980	6.92	4.47 - 9.37	30.74	20.84 - 40.64	0.23
1981	6.36	4.39 - 8.33	22.51	15.37 - 29.66	0.28
1982	13.09	7.82 - 18.36	55.56	34.76 - 76.36	0.24
1983	8.61	5.33 - 11.88	44.69	17.23 - 72.15	0.19
1984	5.50	2.96 - 8.03	18.42	11.67 - 25.16	0.30

APPENDIX TABLE 28.

WINTER FLOUNDER :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4									.034	
5										
6										
7				.038						
8										
9	.111			.314	.115					
10	.221			.269	.094					.094
11	.330	.144		1.088	.523					
12	.824	.143	.043	1.446	.826					
13	.426	.096	.080	1.696	1.562					.503
14	.415	.192		1.785	1.785				.041	.773
15	.894	.191	.298	2.060	1.827				.329	.823
16	.694	.239	.080	2.241	1.809	.077			.725	.740
17	.958	.191	.225	2.400	1.301	.317		.071	1.481	.933
18	1.710	.382	.080	2.710	1.424	.699			1.189	.529
19	2.103	.429	.072	4.334	2.654	.546		.080	2.620	.794
20	2.339	.429	.154	4.983	2.855	.459	.053	.212	2.240	1.194
21	1.894	1.097	.152	5.612	3.316	.372	.105	.230	1.463	1.655
22	2.729	.620	.232	4.860	3.517	.508		.159	1.295	.793
23	2.295	.239	.266	4.549	3.245	.208		.380	2.157	.724
24	2.627	.810	.591	4.256	3.577	.383		.150	1.768	1.006
25	2.578	.858	.543	2.672	2.183	.383		.212	3.292	.786
26	2.909	1.050	.430	3.033	2.785	.503	.053		3.846	1.438
27	2.800	1.385	.698	1.689	1.583	.448		.230	4.139	.907
28	3.651	1.005	.381	1.462	3.272	.477		.170	3.751	.719
29	3.919	1.193	.536	1.971	2.432	.328	.105	.457	2.878	1.043
30	4.703	1.051	.755	2.378	2.586	.329		.399	2.314	.958
31	4.368	1.382	1.293	2.265	2.369	.209		.616	1.104	.931
32	5.484	.956	1.011	2.859	1.425	.197		.451	1.871	1.684
33	4.627	1.003	1.494	1.916	1.236	.087		.236	1.008	1.925
34	4.637	.858	.611	2.371	1.114	.055		.582	1.172	1.094
35	3.281	.525	1.288	2.644	1.246	.044		.159	1.280	1.327
36	2.879	.525	.964	1.598	1.084	.044		.145	.688	1.657
37	1.246	.382	.463	1.087	.847	.022		.029	.439	.640
38	1.832	.523	.674	.583	.385	.022			.321	.556
39	1.430	.142	.268	.773	.385	.022			.153	.594
40	.719	.238	.227	.224	.276					.389
41	.679	.191	.589	.383	.152				.041	.126
42	.842		.072	.114	.124					.059
43	.328	.095	.145	.161	.168					
44	.279		.222	.038	.134					
45	.077	.048	.116	.082	.084					.033
46	.164	.047	.145	.041	.084			.072		
47			.043							
48			.145	.038						

APPENDIX TABLE 28 CONT.

WINTER FLOUNDER :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49									.041	
50		.047	.072							
51	.056			.041						
52										
53										
54	.060									
55										
56										
57			.080							
TOTAL:	74.118	18.706	15.540	75.063	56.383	6.736	0.315	5.043	43.680	27.427
AVE.IN:	28.62	27.98	31.85	24.09	24.41	24.09	24.33	28.85	26.02	27.08

APPENDIX TABLE 29. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of SUMMER FLOUNDER for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.20	0.54 - 1.86	1.17	0.32 - 2.03	1.02
1979	0.61	0.26 - 0.95	0.37	0.15 - 0.60	1.63
1980	0.62	0.36 - 0.88	0.36	0.22 - 0.50	1.71
1981	1.04	0.55 - 1.55	1.19	0.43 - 1.96	0.87
1982	1.37	0.58 - 2.15	2.03	0.90 - 3.16	0.67
1983	1.20	0.79 - 1.60	1.18	0.79 - 1.57	1.02
1984	0.39	0.20 - 0.59	0.30	0.14 - 0.45	1.31

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.83	0.51 - 1.16	0.55	0.33 - 0.78	1.51
1979	0.26	0.04 - 0.49	0.17	0.02 - 0.32	1.58
1980	0.71	0.40 - 1.02	0.50	0.25 - 0.75	1.41
1981	0.63	0.36 - 0.89	0.77	0.44 - 1.10	0.81
1982	1.36	1.01 - 1.72	1.75	1.26 - 2.23	0.78
1983	0.86	0.53 - 1.19	0.75	0.44 - 1.06	1.15
1984	0.84	0.50 - 1.17	0.86	0.47 - 1.25	0.97

APPENDIX TABLE 30.

SUMMER FLOUNDER :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

R E G I O N S

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25						.056				
26						.056				
27										
28	.055									
29										
30						.056				
31	.167									
32						.055				
33						.056				
34						.221				
35						.274				
36						.386				
37	.060									
38	.055					.132				
39	.111					.222				
40						.440	.053			
41	.022					.132	.158			
42						.221	.053			
43	.111					.165	.105			
44	.167	.047	.077			.164	.053			
45	.022						.053			
46	.055					.164	.053			
47	.022	.047				.060	.053			
48						.166	.105			

APPENDIX TABLE 30 CONT.

SUMMER FLOUNDER :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
49								.077		
50	.056	.047				.056			.034	
51										
52	.055					.022				
53						.110				
54	.116					.169				
55	.111					.170				
56										
57						.060				
58	.056									
59										
60										
61										
62	.055									
63										
64									.034	
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75			.071							
TOTAL:	1.295	0.142	0.148			3.613	0.684	0.077	0.069	
AVE.LN:	44.45	47.00	58.83			41.37	43.77	49.00	57.00	

APPENDIX TABLE 31. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of AMERICAN PLAICE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.81	1.05 - 2.56	20.39	6.77 - 34.01	0.09
1979	4.00	3.44 - 4.56	51.28	39.04 - 63.53	0.08
1980	5.17	3.97 - 6.37	88.33	60.69 -115.97	0.06
1981	6.97	4.74 - 9.20	73.46	40.62 -106.29	0.10
1982	5.38	3.74 - 7.01	52.73	34.76 - 70.70	0.10
1983	5.50	1.95 - 9.04	35.67	11.01 - 60.33	0.15
1984	2.51	1.85 - 3.18	30.78	16.68 - 44.88	0.08

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	2.96	1.83 - 4.09	59.79	29.58 - 90.01	0.05
1979	1.42	0.70 - 2.14	16.63	9.02 - 24.24	0.09
1980	2.91	2.01 - 3.81	36.95	23.83 - 50.06	0.08
1981	1.64	0.59 - 2.69	14.21	4.78 - 23.64	0.12
1982	2.58	1.16 - 4.00	21.00	10.66 - 31.34	0.12
1983	2.27	1.34 - 3.19	42.18	25.13 - 59.24	0.05
1984	1.07	0.43 - 1.70	10.76	3.38 - 18.14	0.10

APPENDIX TABLE 32.

AMERICAN PLAICE :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5									.172	
6					.020					
7					.104					
8				.211	.590					
9				.612	.546				.035	
10				.979	.546					.132
11				.883	.481				.351	.266
12				.402	1.231				.783	.877
13				.041	3.941				2.471	.502
14				.045	8.612				1.805	.212
15				.261	11.892				1.082	.213
16				.966	12.917				.769	.793
17				2.084	12.929				.334	1.586
18				3.136	10.929				.321	4.305
19				3.371	7.762				.341	4.998
20				5.263	5.389				.657	3.148
21				3.095	2.989				1.249	3.837
22				1.640	3.150				1.254	1.643
23				1.969	4.538				1.194	1.010
24				1.607	3.101				1.164	.719
25				1.079	2.256				.718	.896
26				1.225	1.945				.567	.878
27				.875	2.102				.607	.579
28				.893	1.075				.471	.453
29				.337	1.107				.331	.373
30				.341	.721				.221	.373
31				.840	.340				.301	.107
32				.401	.572				.186	.080
33				.105	.328				.301	.372
34				.269	.397				.140	.186
35				.377	.287				.105	.266
36				.080	.437				.186	.160
37	.060			.196	.248				.045	
38				.115	.331				.070	.046
39				.045	.164				.080	.080
40				.038	.184				.070	
41				.045	.104				.035	
42					.040				.080	
43					.124					
44					.080					.105
45					.040					
46					.187					
47										
48				.080						.105

APPENDIX TABLE 32 CONT.

AMERICAN PLAICE :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49					.040					
50					.020					
51					.060					
52				.045	.020					
53										.105
54										
55										
56										
57					.040					
58					.063					
59										
60					.020					
61					.040					
TOTAL:	0.060			33.953	105.039				18.496	29.403
AVE.IN:	37.00			21.09	18.84				20.25	20.91

APPENDIX TABLE 33. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of WITCH FLOUNDER for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.99	0.48 - 1.49	1.37	0.74 - 1.99	0.72
1979	0.64	0.15 - 1.12	0.62	0.19 - 1.05	1.03
1980	0.65	* - 1.43	0.68	* - 1.45	0.97
1981	1.46	* - 3.23	1.71	* - 3.50	0.85
1982	0.44	* - 0.93	0.56	* - 1.13	0.79
1983	0.59	0.22 - 0.95	0.97	0.31 - 1.64	0.60
1984	0.48	0.15 - 0.82	0.69	0.13 - 1.26	0.70

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.07	0.35 - 1.80	1.07	0.46 - 1.67	1.01
1979	0.50	* - 1.03	0.63	* - 1.32	0.79
1980	0.83	0.12 - 1.54	0.77	0.14 - 1.40	1.07
1981	0.11	* - 0.25	0.16	* - 0.41	0.65
1982	0.35	0.13 - 0.56	0.56	0.04 - 1.09	0.62
1983	1.22	0.30 - 2.14	1.72	0.48 - 2.96	0.71
1984	0.20	0.06 - 0.35	0.28	0.10 - 0.46	0.73

*Negative Lower Limit.

APPENDIX TABLE 34.

WITCH FLOUNDER :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19					.020					
20					.020					
21										
22										
23										
24					.040					
25					.040					
26					.060					
27					.040					
28					.040					
29										
30					.020					
31					.104					
32					.060					
33					.248					
34					.020					
35					.040					.027
36					.104					.080
37					.084					
38					.208					.159
39					.104					
40				.090	.293				.041	.121
41				.041	.020					.099
42					.084					.094
43					.084					
44					.084					.105
45				.035						.027
46				.131						.094
47					.104					
48				.045	.063					.046

APPENDIX TABLE 34 CONT.

WITCH FLOUNDER :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49										
50				.082						.151
51					.273					.105
52				.045	.020					
53				.045						
54				.045	.169					
55									.045	
56										.105
57				.045						
58				.045						
59										
60										
61										
62										
63										
64										
65										
66			.072							
TOTAL:			0.072	0.650	2.447				0.086	1.214
AVE.LN:			66.00	48.50	39.53				47.88	44.42

APPENDIX TABLE 35. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of WINDOWPANE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	9.08	6.08 - 12.09	31.48	21.12 - 41.85	0.29
1979	8.46	5.42 - 11.50	30.12	19.78 - 40.47	0.28
1980	8.36	4.91 - 11.81	28.28	16.78 - 39.77	0.30
1981	11.12	6.90 - 15.34	36.83	22.43 - 51.23	0.30
1982	11.40	2.95 - 19.85	44.39	7.21 - 81.56	0.26
1983	7.16	4.79 - 9.53	23.62	16.40 - 30.83	0.30
1984	4.00	2.71 - 5.28	13.55	9.20 - 17.90	0.30

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.98	0.53 - 1.42	5.26	2.49 - 8.03	0.19
1979	1.91	1.19 - 2.63	8.49	5.59 - 11.39	0.22
1980	1.64	1.02 - 2.27	7.60	4.75 - 10.44	0.22
1981	1.09	0.51 - 1.68	7.78	2.67 - 12.89	0.14
1982	1.64	0.86 - 2.41	7.40	4.11 - 10.69	0.22
1983	0.86	0.53 - 1.18	4.45	2.56 - 6.33	0.19
1984	0.73	0.24 - 1.22	3.21	0.91 - 5.51	0.23

APPENDIX TABLE 36.

WINDOWPANE :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										.033
6	.055									
7										
8	.109					.055				.033
9								.077		
10	.056							.148		
11				.038		.110		.239		
12	.167	.048	.080		.147	.111				
13	.110	.144	.072		.061	.056		.077		
14	.116	.048	.077	.076	.383	.056		.077		
15	.451		.149	.168	1.210	.223				
16	.397			.127	.647	.167			.041	
17	.247			.086	.605	.056				
18	.331	.048	.396	.120	.486	.167				
19	.457		.301	.124	.447	.111				.059
20	.622		.212	.168	.374				.069	.033
21	.221	.286	.218	.083	.040	.189				.409
22	.501	.288	.312	.131	.124	.022		.080		.574
23	.570	.095	.464	.185	.103	.327		.080	.107	1.128
24	.967	.431	.298	.451	.050	.714		.313	.034	.628
25	1.291	1.244	1.079	.419	.229	.415	.105		.162	.673
26	1.705	1.720	2.489	.741	.280	.222		.154	.308	1.043
27	1.951	1.864	2.938	.282	.784	.222		.080	.285	.739
28	1.277	1.812	2.829	.240	.634	.279	.211	.316	.285	.865
29	1.178	2.488	1.453	.255	.653	.022	.053	.319	.041	.450
30	.917	2.290	1.820	.145	.521	.022	.053	.159	.158	.218
31	.497	3.058	1.370	.038	.465	.055	.053	.077	.041	.059
32	.557	2.003	1.066	.034	.247		.053	.223	.082	
33	.242	.620	.771	.120	.129		.053	.143		.059
34	.285	.952	.307	.073	.040		.105	.225		
35	.169	.572	.717				.053	.072		.059
36	.109	.668	.313							
37	.273	.288	.452	.038						
38	.164	.477	.304				.053	.072		
39		.382						.143		
40		.143	.148							
41	.055	.047								
42	.055									
43										
44		.048								
TOTAL:	16.102	22.065	20.635	4.143	8.659	3.600	0.789	3.074	1.614	7.063
AVE.IN:	25.56	29.72	28.18	24.39	22.29	21.84	30.53	25.95	26.58	25.20

APPENDIX TABLE 37. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of ATLANTIC HERRING for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.29	* - 0.69	34.56	* - 91.11	0.01
1979	0.67	* - 1.36	17.35	0.35 - 34.35	0.04
1980	0.63	0.06 - 1.21	14.89	* - 32.17	0.04
1981	0.37	0.04 - 0.70	5.66	* - 13.55	0.07
1982	0.12	0.01 - 0.22	2.74	* - 5.58	0.04
1983	0.93	* - 2.20	22.93	* - 53.35	0.04
1984	0.56	* - 1.18	10.88	* - 22.55	0.05

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.41	0.03 - 0.80	8.51	* - 17.18	0.05
1979	0.03	* - 0.07	5.36	* - 15.29	0.01
1980	0.10	0.01 - 0.19	1.49	0.31 - 2.67	0.07
1981	0.09	0.01 - 0.18	1.09	0.00 - 2.18	0.09
1982	0.16	0.01 - 0.31	3.92	* - 8.68	0.04
1983	0.57	0.11 - 1.03	7.19	0.68 - 13.70	0.08
1984	0.74	0.08 - 1.40	6.36	0.34 - 12.37	0.12

*Negative lower limit.

APPENDIX TABLE 38.

ATLANTIC HERRING :

Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	R E G I O N S									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4	2.007									
5	.056			.045						
6										
7										
8										
9									.035	
10										.105
11						.022				.528
12				.045		.022			.331	.105
13									.226	.105
14				.319	.040				.045	.027
15				2.094	.218					
16				6.018	.040					
17				21.261	.119					
18				9.682	.040					.237
19				2.271					.163	.027
20				1.008					1.180	.133
21				.498	.040				5.266	.453
22				.090	.020				6.717	.373
23				.045	.020				4.380	.240
24				.045	.020				2.531	.293
25									1.806	.373
26					.020				.595	.318
27									.080	.159
28										.133
29										
30										
31				.045						
TOTAL:	2.062			43.468	0.574	0.044			23.356	3.609
AVE.IN:	4.03			17.21	17.25	11.50			22.14	20.28

APPENDIX TABLE 39. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of BUTTERFISH for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.16	* - 0.34	1.14	* - 2.34	0.14
1979	0.02	* - 0.06	0.28	* - 0.67	0.08
1980	0.38	* - 0.87	5.46	* - 11.02	0.07
1981	0.11	* - 0.28	0.99	* - 2.40	0.11
1982	0.01	0.00 - 0.02	0.10	* - 0.20	0.10
1983	0.12	0.01 - 0.22	1.16	0.31 - 2.02	0.10
1984	0.25	0.04 - 0.47	2.43	0.31 - 4.55	0.10

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.42	0.95 - 1.89	132.68	85.97 -179.40	0.01
1979	0.89	0.62 - 1.16	74.55	51.58 - 97.51	0.01
1980	4.61	1.99 - 7.23	418.75	177.91 -659.59	0.01
1981	2.38	1.53 - 3.22	102.78	66.14 -139.14	0.02
1982	1.65	0.31 - 2.99	174.04	13.75 -334.34	0.01
1983	1.91	1.40 - 2.41	162.92	118.16 -207.68	0.01
1984	1.13	0.67 - 1.60	58.50	38.01 - 79.00	0.02

*Negative lower limit.

APPENDIX TABLE 40.

BUTTERFISH :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1						.056				
2						.056	.053		.041	.105
3						.110	.053	2.708		
4						1.403	.158	25.774		
5						.537	.158	19.706		
6						3.449	.369	13.240		
7						3.116	1.424	9.764	.076	
8						15.603	1.845	5.169	.854	.979
9						43.864	5.535	1.703	3.545	6.395
10						43.978	18.399	.432	2.472	8.281
11	.219					27.993	24.568	.149	.532	2.898
12	.077					3.062	4.851		.577	.230
13	.492					2.221	.474			
14	.399					2.364	.475		.038	.264
15	.743	.048	.071			.197			.110	.132
16	3.563	.144					.369		.034	
17	4.503	.096				.022			.311	.159
18	1.689	.047							.249	.213
19	.426					.022			.245	.185
20	.164								.122	
21									.041	
TOTAL:	12.273	0.335	0.071			148.054	58.729	78.647	9.248	19.841
AVE.IN:	16.44	16.43	15.00			9.60	10.38	5.34	10.52	10.02

APPENDIX TABLE 41. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of AMERICAN SAND LANCE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	2.80	* - 6.05	243.32	* - 509.45	0.01
1979	0.88	* - 2.14	117.65	* - 274.21	0.01
1980	1.90	* - 4.34	202.88	* - 506.07	0.01
1981	2.13	0.85 - 3.42	233.16	107.40 - 358.93	0.01
1982	2.11	* - 5.43	284.28	* - 763.90	0.01
1983	0.17	0.00 - 0.34	23.31	9.97 - 56.60	0.01
1984	0.75	* - 1.73	69.34	* - 160.11	0.01

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.10	* - 0.22	26.35	* - 64.77	< 0.01
1979	0.06	* - 0.16	12.46	* - 33.23	< 0.01
1980	0.03	* - 0.07	4.83	* - 11.26	0.01
1981	0.03	* - 0.07	6.06	* - 14.00	< 0.01
1982	1.55	* - 4.35	352.59	* - 998.88	< 0.01
1983	< 0.01	< 0.01	0.04	* - 0.88	< 0.01
1984	0.00	* - 0.02	0.88	* - 2.50	0.01

*Negative lower limit.

APPENDIX TABLE 42.

AMERICAN SAND LANCE :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

R E G I O N S

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10						.109	.053			
11	2.508		.245	.038		.164				
12	43.030		.846	.343		1.640	.053			
13	51.892		22.851	.730		1.093				
14	45.538	.048	57.471	.687		1.148				
15	10.144		101.985	.575		.164				
16	3.790		63.380	.232		.109				
17			9.741	.161		.055				
18			9.437	.076						
19	1.282		.043	.041						
20			.043							
TOTAL:	158.184	0.048	266.043	2.884		4.482	0.105			
AVE.LN:	13.23	14.00	15.02	14.17		12.94	11.00			

APPENDIX TABLE 43. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of SPINY DOGFISH for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	23.57	* - 47.69	11.24	* - 27.40	2.10
1979	6.41	3.38 - 9.44	1.85	0.80 - 2.92	3.45
1980	6.14	2.15 - 10.14	1.70	0.51 - 2.89	3.62
1981	6.90	0.59 - 13.20	1.55	0.05 - 3.06	4.44
1982	9.29	1.98 - 16.60	1.98	0.40 - 3.57	4.68
1983	3.26	1.48 - 5.05	0.84	0.39 - 1.30	3.88
1984	12.39	5.80 - 18.99	6.92	2.52 - 11.32	1.79

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	229.71	48.56 -410.85	151.71	28.29 -275.12	1.51
1979	40.17	6.17 - 74.17	12.55	3.49 - 21.62	3.20
1980	18.55	* - 46.75	4.96	* - 12.49	3.74
1981	46.37	* -104.17	11.57	* - 25.88	4.01
1982	180.36	* -391.44	54.07	* -114.18	3.34
1983	40.56	* - 85.92	14.67	* - 29.83	2.76
1984	124.21	51.33 -197.10	68.49	26.02 -110.95	1.81

*Negative lower limit.

APPENDIX TABLE 44.

SPINY DOGFISH :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26				.041						
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45								.080		
46										
47								.080		
48								.029		

APPENDIX TABLE 44 CONT.

SPINY DOGFISH :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

R E G I O N S

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
49								.179		
50								.058		
51	.022							.380		
52	.142	.047						.179		
53	.166		.080					.603		
54	.366		.150					.630		.105
55	.589							.451		.046
56	.804	.047	.080					6.723		.094
57	1.050	.095	.080					9.596		.105
58	1.413	.095	.469					8.418		
59	1.920	.189	.399					4.696		.140
60	1.672	.142	.080					11.484		.232
61	1.670	.189	.399					11.255		.046
62	1.786		.558					7.737		.197
63	1.268	.189	.399					6.877		.184
64	1.238	.237	.316					8.246		.478
65	1.407	.047	.478					14.243		.421
66	.965	.047	.389					8.130		.338
67	.907	.047	.319					7.661		.594
68	1.126	.047	.399					3.042		.667
69	.766	.095	.399					8.531		.557
70	.803		.080					17.290	.082	.856
71	.411	.047	.150					16.203	.382	.808
72	.503		.080					8.304		.851
73	.110	.047	.071					20.805		1.283
74	.115	.047						15.020	.041	.981
75	.098	.142	.141					33.170		1.597
76	.115		.080					27.453		1.461
77	.175	.047						20.476	.076	1.999
78	.230	.047	.157					28.955	.045	2.042
79	.060		.071					22.620		.978
80	.055		.080					19.942	.041	1.755
81	.055	.095	.150					14.422	.123	1.222
82		.047						15.656		1.334
83	.055		.157					9.436	.038	.837
84	.060	.047	.080					.316	.041	.292
85	.022	.047	.150					2.137	.801	.257
86		.047	.159					2.314		
87	.055	.047	.077					.312	1.262	
88	.115	.047						.596	1.344	
89	.077	.047	.159					.312	.499	.094
90			.159					.309	.832	.094
91	.055	.047						.551	.496	
92	.224							.316	.545	.094
93	.115		.236					.543	.246	.165
94	.132	.047	.310					.462	.420	.211
95	.158	.095	.159					.629	.464	.224
96	.055	.047	.307					2.159	.578	

APPENDIX TABLE 44 CONT.

SPINY DOGFISH :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
97	.109	.190	.310					.384	1.426	.105
98	.169	.095	.289					1.029	2.269	.105
99	.169	.095	.469					.391	2.923	.046
100	.377		.715					.319	1.589	
101	.137	.047	.316					.428	1.264	.046
102	.246	.047	.080					.080	.883	
103	.186	.142	.080					.080	.496	.200
104	.109		.080						.960	
105	.060							.072		
106									.537	
107								.080	.079	
108	.022							.080		
109		.047							.382	
110	.022		.080							
111									.382	
TOTAL:	24.734	3.215	10.423	0.041				402.959	21.546	24.144
AVE.LN:	66.72	76.60	77.98	26.00				72.73	95.83	76.01

APPENDIX TABLE 45. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of LITTLE SKATE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	14.10	6.74 - 21.46	32.09	9.48 - 54.71	0.44
1979	18.22	12.58 - 23.85	38.11	24.65 - 51.57	0.48
1980	11.93	7.88 - 15.98	25.83	16.51 - 35.16	0.46
1981	26.94	19.63 - 34.26	54.58	38.78 - 70.37	0.49
1982	15.34	6.93 - 23.75	38.52	12.46 - 64.58	0.40
1983	10.05	7.71 - 12.40	17.01	13.45 - 20.58	0.59
1984	9.37	6.18 - 12.56	16.78	11.19 - 22.38	0.56

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	6.43	4.46 - 8.41	11.21	7.75 - 14.67	0.57
1979	15.28	10.70 - 19.86	28.87	19.90 - 37.84	0.53
1980	13.82	8.96 - 18.67	27.59	16.06 - 39.11	0.50
1981	7.31	4.60 - 10.02	13.28	7.75 - 18.81	0.55
1982	16.48	12.35 - 20.60	30.77	22.92 - 38.62	0.54
1983	8.68	6.06 - 11.31	17.30	10.69 - 23.90	0.50
1984	7.37	4.01 - 10.74	12.53	6.71 - 18.35	0.59

APPENDIX TABLE 46.

LITTLE SKATE :

Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10				.034						
11									.038	
12				.111						
13				.137						
14				.034					.076	
15	.055									.033
16				.073					.082	
17	.180			.041	.031				.082	
18	.055			.151					.079	
19	.115		.071	.148					.038	
20	.115	.048		.341					.038	.033
21				.158	.031				.041	.066
22	.142			.196					.124	.152
23	.060			.076			.053		.158	.192
24	.377	.096	.071	.305	.040			.080	.273	.092
25	.295			.300					.172	.033
26	.202	.048	.212	.273					.231	.237
27	.120		.212	.149	.050				.148	.211
28	.137	.048	.212	.114					.310	.431
29	.022	.096	.141	.221	.050				.299	.192
30	.154		.071	.298					.258	.370
31	.530	.048	.071	.263		.172	.105		.404	.284
32	.487	.192	.212	.422		.056			.269	.211
33	.521	.240		.260		.022			.272	.633
34	.586	.335	.227	.521	.050	.022			.380	.363
35	.815	.096	.141	.514					.141	.396
36	1.049	.288	.148	.359	.139	.060		.077	.340	.350
37	.960	.240	.212	.454		.180			.473	.706
38	.486	.335	.504	.443					.600	.614
39	.880	.718	.362	.457			.053		.473	.244
40	1.389	.527	.737	.473	.139	.240	.053		.448	.330
41	.902	.622	.725	.377	.050	.120	.105	.080	.608	.666
42	1.399	.623	.743	.553	.050	.175	.158	.227	.469	.092
43	1.892	.957	1.026	.709	.199	.614	.421	.077	.737	.277
44	2.115	1.055	.888	.746		1.363	.473	.157	.757	.726
45	3.472	1.438	1.616	.833	.149	2.697	.946	.313	1.323	.581
46	4.098	1.244	1.996	1.389		3.675	.736	.476	.593	.654
47	3.627	1.434	1.554	1.037	.040	2.733	.842	.756	1.062	.310
48	2.813	1.103	1.514	1.144	.050	2.069	.316	.620	.765	.634

APPENDIX TABLE 46 CONT.

LITTLE SKATE :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49	1.397	.527	.650	1.290	.228	1.496	.263	.186	1.287	.357
50	.814	.047	.495	1.823	.299	.411	.053	.150	1.775	.779
51	.087	.047	.230	1.293	.238	.180	.053		1.666	.663
52	.060		.071	.921	.489	.111		.071	1.464	.596
53			.080	.846	.099				.969	.561
54				.531	.549				.590	.713
55				.342					.124	.284
56				.118	.147					.105
57				.041	.070				.079	
58					.031					
TOTAL:	32.409	12.449	15.191	21.321	3.215	16.398	4.629	3.270	20.516	14.173
AVE.LN:	42.10	42.73	43.09	42.11	47.72	45.90	44.91	45.66	43.27	41.54

APPENDIX TABLE 47. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of WINTER SKATE for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	12.92	8.04 - 17.80	4.57	2.57 - 6.57	2.83
1979	15.62	9.07 - 22.18	5.45	3.21 - 7.68	2.87
1980	15.96	10.95 - 20.96	9.52	5.58 - 13.47	1.68
1981	44.30	32.61 - 55.99	39.60	28.40 - 50.80	1.12
1982	31.27	18.88 - 43.66	20.23	9.63 - 30.83	1.55
1983	25.92	17.04 - 34.79	17.91	13.64 - 22.18	1.45
1984	43.32	16.28 - 70.37	29.60	16.69 - 42.51	1.46

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	7.86	2.09 - 13.63	3.96	1.90 - 6.01	1.99
1979	10.60	7.17 - 14.04	5.56	3.77 - 7.35	1.91
1980	15.96	6.53 - 24.42	8.60	5.50 - 11.71	1.80
1981	11.90	7.76 - 16.04	7.60	5.16 - 10.04	1.57
1982	31.77	22.65 - 40.88	18.33	12.79 - 23.86	1.73
1983	15.59	7.77 - 23.42	11.98	6.84 - 17.12	1.30
1984	14.56	6.18 - 22.94	7.05	3.86 - 10.24	2.06

APPENDIX TABLE 48.

WINTER SKATE :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

R E G I O N S

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13	.056									
14	.334									
15	.390									
16	.454									
17	.570									
18	.733				.031			.072		
19	.282		.072		.040					
20	.222		.214					.072		
21	.282		.072		.031					
22	.726	.096			.040			.072		
23	1.149					.056				
24	2.145		.638							
25	2.110	.096	.565							
26	1.856	.048	.781		.070			.072	.076	
27	1.294		1.451		.070			.077		
28	.695	.048	.857	.038	.226				.038	
29	1.713	.096	.725	.076	.079	.056		.227		
30	1.920	.096	1.181	.038	.089	.056		.231	.172	
31	1.789	.143	1.822	.153	.031	.056		.311	.183	.033
32	2.126	.144	1.804	.191	.079		.053	.149	.107	.033
33	1.852	.336	1.245	.153	.040			.256	.103	
34	2.983	.718	2.946	.153	.040		.158	.234	.359	
35	1.905	.382	2.459	.346	.040			.148	.137	.033
36	2.567	.478	3.861	.229	.169	.056		.260	.103	
37	1.437	.671	2.475	.461	.149	.056		.701	.172	.033
38	1.249	.622	4.066	.454	.099		.158	.699	.034	.033
39	1.259	.621	2.891	.114	.221		.105	.948	.176	
40	.754	.764	3.610	.153	.050	.111	.158	1.203	.114	
41	1.000	.623	2.896	.114	.099	.111		.870		.033
42	.409	.384	1.704	.114	.080	.056	.158	1.153	.069	
43	.172	.096	2.120	.229	.099	.055		.567		
44	.314	.575	3.655	.153		.055	.105	.617		.092
45	.296	.383	2.299		.180		.053	1.139	.038	.059
46	.176	.430	1.709	.118		.056		.709	.159	.119
47	.176	.191	1.325	.266	.103			.924	.191	.092
48	.198	.335	1.173	.038			.053	.398	.076	

APPENDIX TABLE 48 CONT.

WINTER SKATE :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
49	.227	.525	1.643	.076	.149		.053	.949		.033
50	.111	.238	3.283	.079	.040		.105	.621	.118	.033
51	.291	.238	.740	.041			.158	.374	.114	
52	.056	.430	2.950	.079				.762	.118	
53	.060	.095	1.477	.079	.115	.111		.505	.038	
54	.232	.096	2.587	.107		.055	.053	.525		
55	.397	.143	.312	.034	.099			.517	.079	.178
56	.056	.191	1.284	.125	.337			.541		.448
57	.116	.096	1.065	.165	.099		.105	.760	.079	.178
58			1.418		.099			.546		.033
59		.095	2.896	.079	.050	.060		.157	.034	.059
60	.116	.047	1.464	.041				.709		
61	.111	.095	1.236					.640	.069	.092
62	.060	.047	1.526	.155				.673		
63		.142	1.863	.035	.084			.304	.034	
64		.143	1.138	.199				.567		
65	.111		2.422	.122				.703	.079	
66	.060	.047	1.508					1.073		
67	.115	.143	2.196	.117				.236		
68	.060		1.808	.127	.063			.762		
69		.047	1.869	.148				.709		
70	.056		1.334	.113				.295	.041	.033
71			.428	.082	.084			.476		
72		.095	.861	.196	.031			.745		
73		.095	1.175	.079				.396		
74		.048	2.091	.082				.623	.034	.079
75	.060		1.744	.038				.516		
76		.048	1.870	.121				.921		
77			1.234	.193	.094			.532		.094
78	.022	.047	.926		.084			.455	.034	
79		.048	.929	.038				.225		.033
80	.056		1.499	.162				.614		
81			1.118	.073				.536		
82	.060	.047	1.416	.190				.452		
83	.082		1.426	.158	.084			.682	.083	
84	.055		1.269	.124				.331		
85			1.677	.117				.276		
86	.056	.095	.609	.110			.053	.413		
87		.048	.834	.083	.020		.053	.409	.045	.059
88	.060		.736	.158				.490		
89	.116	.047	.986	.041	.050			.177		
90	.055	.096	.417	.286				.382		
91	.060		.986	.045	.084			.395		
92			.193	.038				.141		
93			.735					.291		
94			.291		.020			.100		
95		.048	.071					.227		
96		.048	.077	.076				.077		

APPENDIX TABLE 48 CONT.

WINTER SKATE :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	R E G I O N S									
CMS	1	2	3	4	5	1	2	3	4	5
97			.141					.141		
98			.043					.106		
99			.227					.109		
100			.043					.080		
101			.080					.071		
102			.071					.154		
103								.150		
104			.043							
105								.100		
106								.071		
107										
108			.071							
TOTAL:	40.508	12.044	114.946	8.002	3.840	1.004	1.579	36.906	3.307	1.916
AVE.IN:	33.11	45.54	54.82	57.15	47.99	41.28	46.54	60.54	44.20	55.44

APPENDIX TABLE 49. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of LONGFIN SQUID for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	0.66	0.25 - 1.08	6.47	3.02 - 9.93	0.10
1979	2.11	1.06 - 3.16	25.87	10.62 - 41.12	0.08
1980	2.72	1.04 - 4.40	20.73	9.00 - 32.46	0.13
1981	0.56	0.19 - 0.93	6.21	2.94 - 9.48	0.09
1982	0.69	0.07 - 1.31	8.48	3.56 - 13.41	0.08
1983	3.58	1.16 - 6.01	46.20	26.22 - 66.18	0.08
1984	2.36	1.18 - 3.54	33.77	21.48 - 46.07	0.07

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	4.18	2.93 - 5.43	560.33	15.07-1105.60	0.01
1979	2.66	1.70 - 3.62	362.34	194.15-530.53	0.01
1980	3.12	2.26 - 3.97	265.44	199.10-331.78	0.01
1981	3.68	2.96 - 4.41	284.80	207.44-362.15	0.01
1982	3.64	2.34 - 4.95	650.86	420.77-880.95	0.01
1983	3.16	1.48 - 4.84	406.72	294.53-518.92	0.01
1984	1.78	1.21 - 2.35	132.36	83.67-181.04	0.01

APPENDIX TABLE 50.

LONGFIN SQUID :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

R E G I O N S

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1						.896	1.260			
2	.056					33.269	39.247	2.079	2.863	.066
3	.448	.618	.448			30.689	26.758	11.657	7.011	.349
4	1.725	1.907	.799			22.482	12.489	42.469	16.703	.375
5	3.295	4.763	1.428			27.099	13.842	48.289	31.104	1.126
6	2.916	3.762	2.222			25.799	14.686	35.847	26.181	1.600
7	2.531	1.953	3.350			20.592	15.323	36.627	17.146	.856
8	1.967	2.475	2.591			18.440	12.219	12.850	11.658	1.245
9	1.721	3.329	2.672			15.033	4.950	2.513	7.200	1.483
10	2.629	3.281	4.549			5.783	2.845	1.223	4.105	2.403
11	5.650	8.001	3.401			4.070	1.631	.616	2.175	1.554
12	4.916	11.920	2.167			1.680	.895	.688	.913	.659
13	3.333	12.744	.853			1.631	.526		.473	.105
14	1.884	10.116	.234			.333	.527	.077	.309	.027
15	1.651	7.976	.393			.703	.315		.110	
16	.877	6.779	.080			.284	.105		.103	
17	.770	4.872	.154			.056	.053			
18	.384	3.865	.154			.220	.105		.034	
19	.317	3.198	.388			.056			.035	
20	.634	2.530	.077			.056				
21	.219	2.388	.071						.034	
22	.384	1.625					.053			
23	.169	1.195							.045	
24	.153	1.049	.154							
25	.220	1.339	.157						.075	
26		.668								
27		.764								
28		.668								
29		.862	.154			.056				
30		.384								
31		1.244	.077							
32		.238	.154							
33		.096								
34										
35										
36		.096								
37		.096	.077							
38										
39		.096								
40		.047								
TOTAL:	38.848	106.945	26.803			209.225	147.829	194.934	128.279	11.849
AVE.LN:	10.61	14.12	9.76			5.44	4.73	5.52	6.07	8.27

APPENDIX TABLE 51. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of AMERICAN LOBSTER for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.09	0.59 - 1.59	3.17	1.71 - 4.63	0.34
1979	0.82	0.31 - 1.33	2.34	0.61 - 4.07	0.35
1980	1.16	0.61 - 1.71	3.56	1.49 - 5.63	0.33
1981	2.77	0.63 - 4.91	10.07	1.40 - 18.73	0.28
1982	1.02	* - 2.09	3.59	* - 7.94	0.28
1983	0.79	0.45 - 1.13	2.35	1.15 - 3.56	0.34
1984	1.02	0.72 - 1.31	3.31	2.17 - 4.44	0.31

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	2.46	1.02 - 3.89	10.01	2.96 - 17.06	0.25
1979	3.68	0.88 - 6.48	13.81	2.20 - 25.41	0.27
1980	1.56	1.16 - 1.95	4.97	4.00 - 5.95	0.31
1981	1.98	0.86 - 3.09	7.40	2.75 - 12.04	0.27
1982	2.14	1.02 - 3.26	6.66	2.41 - 10.92	0.32
1983	3.84	1.64 - 6.04	14.70	2.83 - 26.57	0.26
1984	3.14	0.99 - 5.28	14.85	0.08 - 29.61	0.21

*Negative lower limit.

APPENDIX TABLE 52.

AMERICAN LOBSTER :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
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27										
28										
29										
30										
31	.055								.137	
32	.055									
33										
34	.055					.022				.059
35									.137	.033
36									.378	
37	.056					.022			.137	.092
38	.055								.893	.059
39						.055			.653	.033
40	.165				.099	.044			.378	.297
41	.055						.053		.481	.092
42	.056					.109			1.893	.185
43			.154		.050				1.412	.105
44	.056		.080		.050	.066			1.099	.225
45					.099				1.237	.277
46	.056								1.454	.185
47	.167				.050	.078			1.756	.218
48	.109				.050	.022			1.556	.138

APPENDIX TABLE 52 CONT.

AMERICAN LOBSTER :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

R E G I O N S

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
49				.045					1.309	.119
50	.167		.077						1.656	.310
51	.077	.048			.079				.869	.105
52		.048			.089				1.138	.448
53	.055			.034	.129	.022			1.031	.231
54		.047			.050	.022		.071	.996	.421
55	.055				.050				1.412	.317
56		.048		.038	.228				.970	.588
57	.056		.072	.041	.050				.973	.402
58	.110	.047		.172	.202			.077	1.148	.579
59	.220			.038	.129				.442	.586
60	.221			.034	.231				.396	.482
61	.055				.327				.114	.448
62	.165				.050	.022			.778	.409
63	.109	.048		.155	.159				.897	1.035
64	.055				.089	.022			.444	.395
65	.166			.041	.149				.592	.365
66	.055			.076	.190				.437	.846
67	.273		.077	.165	.388	.022			.754	.955
68	.109	.047		.246	.229			.071	1.103	.310
69	.115			.120	.228	.055			.624	.726
70	.187			.120	.265			.071	.421	.902
71	.109			.086	.099			.071	.274	.930
72	.164			.206	.404				.505	.798
73	.109			.079	.139				.272	.553
74	.077		.080	.196	.198			.071	.290	.715
75			.080	.079	.292				.405	.456
76	.115			.172	.109			.071	.414	.830
77				.192	.400				.255	.554
78	.220		.116	.162	.040				.117	.680
79	.055			.118	.529	.022		.148	.365	.495
80				.206	.254			.071	.363	1.021
81	.055		.077	.123	.140	.022			.341	.384
82					.063				.311	.640
83									.082	.289
84	.056			.045	.050				.083	.766
85					.040				.316	.276
86				.114		.022			.176	.455
87					.040				.086	.744
88	.056				.144				.137	.283
89				.041	.103			.071		.349
90				.038		.110			.137	.454
91					.051				.132	.310
92					.084			.071	.159	.172
93				.038					.082	.420
94			.077					.071	.083	.046
95				.035					.038	
96				.034						

APPENDIX TABLE 52 CONT.

AMERICAN LOBSTER :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
TOTAL:	4.200	0.334	0.966	3.367	6.903	0.756	0.053	1.011	37.568	25.891
AVE.IN:	60.75	57.41	69.46	73.21	68.76	57.18	41.00	77.68	55.77	69.92

APPENDIX TABLE 52 CONT.

AMERICAN LOBSTER :
Stratified mean number per tow (untransformed) by
length frequency for regions 1-5 Massachusetts
inshore bottom trawl survey, spring and autumn, 1984.

	SPRING					AUTUMN				
	REGIONS									
CMS	1	2	3	4	5	1	2	3	4	5
97				.038						
98										
99										.094
100					.020					
101										
102								.080		
103										
104				.035						.059
105										.033
106										
107										
108										
109										
110										
111										
112										
113										
114										
115										
116										
117										
118									.038	
119										
120										
121										
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123			.077							
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138										
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140										
141										
142										
143										
144										.105

APPENDIX TABLE 53. Stratified mean catch per tow (kilograms and number), estimate of precision and average weight per individual of ROCK CRAB for all Massachusetts inshore strata sets, spring and autumn, 1978 - 1984.

SPRING

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	1.39	0.51 - 2.27	22.16	5.25 - 39.06	0.06
1979	1.25	0.70 - 1.80	11.57	6.72 - 16.41	0.11
1980	0.78	0.34 - 1.23	6.21	3.42 - 9.00	0.13
1981	2.10	1.42 - 2.78	18.74	11.60 - 25.88	0.11
1982	1.55	0.84 - 2.26	16.10	7.97 - 24.22	0.10
1983	0.94	0.70 - 1.18	7.19	5.05 - 9.33	0.13
1984	0.73	0.23 - 1.23	4.91	1.80 - 8.02	0.15

AUTUMN

	Mean Wt./tow	95% Confidence Limits	Mean No./tow	95% Confidence Limits	Wt./no.
1978	3.36	2.35 - 4.37	43.74	22.68 - 64.81	0.08
1979	4.74	2.58 - 6.91	45.86	22.92 - 68.79	0.10
1980	4.14	3.17 - 5.11	55.60	28.67 - 82.53	0.07
1981	0.18	0.10 - 0.25	6.27	* - 13.59	0.03
1982	4.48	3.59 - 5.38	50.46	35.02 - 65.91	0.09
1983	2.09	1.49 - 2.70	16.16	11.66 - 20.66	0.13
1984	2.39	1.03 - 3.74	20.06	8.71 - 31.40	0.12

*Negative lower limit.

APPENDIX TABLE 54.

ROCK CRAB :
Stratified mean number per tow (untransformed) by length frequency for regions 1-5 Massachusetts inshore bottom trawl survey, spring and autumn, 1984.

REGIONS

	SPRING					AUTUMN				
CMS	1	2	3	4	5	1	2	3	4	5
1	.056					.541			.653	
2	.055		.362	.069		.116			.515	
3	.351	.047	.143	.111	.031	.475			.121	.066
4	.410		.212	.038		.685	.211		.176	
5	.580	.048	.072	.038		1.155	.263		.405	
6	1.059	.095		.159		1.833	.210	.220	.995	.152
7	.908	.191	.372	.429	.050	1.699	.158	.453	9.928	2.668
8	.978	.288	.669	1.930		1.729	.105	.639	23.767	3.193
9	.814	.383	.150	2.540	.130	1.055	.105	.071	13.864	1.153
10	.655	.287	.159	1.776	.020	1.165	.105	.288	4.055	.430
11	.307	.623	.387	1.755		.725	.053	.217	4.233	.619
12	.164	.240	.310	2.071	.081	.055	.053	.101	3.229	.430
13	.022			.612		.110		.145	2.068	.046
14					.031	.022			.594	
15									.035	
16									.041	
TOTAL:	6.358	2.202	2.838	11.529	0.342	11.365	1.263	2.135	64.679	8.757
AVE.LN:	7.20	9.37	7.49	9.80	9.39	6.95	6.79	8.72	8.62	8.29

Job 2: Evaluation of winter flounder year-class strength

INTRODUCTION

Assessment of prerecruit-sized fish, particularly young-of-the-year (YOY), allows timely development and implementation of management decisions before recruitment occurs. Decisions based on year-class size involve many assumptions about subsequent growth and survival; however, if relative stock size can be detected in the first year of life and corroborated or modified in succeeding years as the cohort matures, allocation decisions might be adjusted.

To predict annual changes in winter flounder recruitment, a standard timeseries of YOY abundance information was collected beginning in 1975. Methodology for estimating YOY abundance was based on knowledge of habitat, age-group behavior, and a highly localized movement pattern (Tyler 1971). Recruitment of winter flounder from southern Cape Cod estuaries is to territorial and offshore fisheries south and east of Cape Cod (Howe and Coates 1975). This population group has been identified as a major Massachusetts stock unit (Pierce and Howe 1977).

METHODS

The seine survey was conducted in six estuaries on the southern shore of Cape Cod. Seining was restricted to the top half of the diurnal tidal cycle. Stratification based on each estuary's littoral perimeter was utilized. A total of 49 stations (147 tows) was allocated in proportion to the relative weight of each stratum (estuary). Sampling site selection was subjective, with consideration given to substrate suitability for efficient seining (i.e., beaches with less than 0.5 m tidal amplitude and smooth intertidal bottom). At each station three hauls, from a depth of 1.0-1.3 m and perpendicular to shore, were made with a 6.4 mm nylon mesh, 6 m straight seine equipped with a heavily weighted lead line to minimize escapement. Area swept was estimated by multiplying seine spread (maintained at 5.5 m with a taut spreader rope) by seining distance (measured by pace).

A FORTRAN program (YOYSTAT), written by DMF personnel, was used to calculate a mean number of YOY/m^2 for each tow. From this an average number of YOY/m^2 and a standard deviation for each stratum were calculated, and for all estuaries combined, a stratified mean, $\bar{y}_{st}$, and variance, $V_{(\bar{y}_{st})}$ were computed for each year.

Area swept was calculated as follows:

$$A_j = (G_j \times P)\ L$$

where: P = length of pace of individual (meters)

L = length of net (meters)

G_j = number of paces taken at tow j

Catch per tow was calculated as follows:

$$y_j = F_j/A_j$$

where: F_j = number of fish at tow j

A_j = area of tow j (meters squared)

Stratum means were calculated as follows:

$$\bar{y}_i = \left(\sum_{j=1}^{n_i} y_j\right)/n_i$$

where: n_i = number of tows in stratum i

Stratum variances were calculated as follows:

$$S_i^2 = \frac{1}{n_i - 1}\left[\Sigma y_j^2 - \frac{(\Sigma y_j)^2}{n_i}\right]$$

Survey stratified means and variances were calculated as follows:

$$\bar{y}_{st} = \frac{1}{N}\sum_{i=1}^{K} N_i \bar{y}_i$$

$$V_{(\bar{y}_{st})} = \frac{1}{N^2}\ \Sigma \frac{N_i S_i^2}{n_i}$$

Where: K = total number of strata

N = total weighting coefficient of all K strata

N_i = weighting coefficient of stratum i

To compare and analyze differences in stratified mean density indices between years, the Wilcoxon two-way nonparametric test was applied to each pair of years. To monitor the predictiveness of our seining methodology, we compared trends in the stratified mean density index to length frequency modes from the spring bottom trawl surveys. Prior tagging and meristic studies (Howe and Coates 1975; Howe et al. 1976; Pierce and Howe 1977) indicate that winter flounder recruit to the fishery by moving from estuaries onto the inshore grounds south and east of Cape Cod, defined in bottom trawl surveys as regions 1, 2, and 3. Winter flounder length-frequency data from trawl stations in these regions were weighted and pooled.

RESULTS AND DISCUSSION

The overall seine index for 1984, expressed as stratified mean density ($\overline{y}_{st}$), was the second lowest in the ten-year timeseries (Table 1, Figure 1). The stratified mean number of YOY ($\overline{y}_i$) for each estuary during 1984 was below each mean for the timeseries (Table 2). When compared to other years, significant differences between $\overline{y}_{st}$ at $P=0.05$ (Table 3) were found between 1984 and 1977 (1984 was significantly lower) and 1984 and 1983 (1984 was significantly higher).

Preliminary age data provided by the NMFS Woods Hole Laboratory's Biological Investigation for fish sampled from regions 1-3 during DMF 1981-1983 spring bottom trawl surveys, reflect the age composition of fish caught during those surveys (Figure 2). As illustrated in Figure 3, winter flounder generally evidence a highly variable length distribution within a year-class due to the protracted spawning period (at least 5 months), differential growth between sexes and individuals, and variable environmental conditions between nursery areas (estuaries).

The length-frequency distribution of the 1981 survey catch (Figure 2) showed yearling fish (the 1980 cohort), depicted by median length, to be relatively abundant at age 1 compared to later cohorts. The seine index has indicated that this year-class was average or perhaps above average in strength. In 1982, the 1981 year-class appeared to be less abundant than its predecessor, consistent with the trend in the seine index. Median lengths at age were in positions nearly identical to those in 1981.

As shown in Figure 3, spring survey catches of winter flounder do not fully represent the actual proportion of age 1 and 2 fish in the population, because of the timing of the survey relative to the differential distribution of these age groups. Age-groups 0 and 1 remain in estuarine and nearshore nursery areas until maturing at either age 2, 3, or 4 when they move offshore during spring or early summer with rising water temperatures (Pearcy 1962; Howe and Coates 1975; Howe et al. 1976). The emigrating two-year-olds are more temperature tolerant than the older fish and so depart somewhat later (Perlmutter 1939); consequently, two-year-olds may not be as consistently available to the survey trawl in May as older flounder.

In 1983, positions of all length-at-age medians were at a lower length (Figure 2), which suggests slower growth during 1982. There is no age 1 median shown for the 1983 sample because only four one-year-olds were aged. The slow growth may be related to relatively lower 1982 water temperatures accompanied by unusually strong and prolonged easterly winds during spring months. According to the New England Climactic Service, 1982 was the harshest spring since 1936. Growth is directly related to temperature (Laurence 1975), and is greatest during spring and summer (Pearcy 1962). It seems likely that an unusually cold spring and early summer delayed and shortened the seasonal growth period resulting in slower growth for all cohorts during 1982.

The 1983 trawl survey catch reflected the relative strength of the 1979 (age 4) and 1980 (age 3) cohorts as observed in the seine survey (Figures 1 and 3). Although ageing of the 1984 samples has not been completed, the length-frequency distribution continues to indicate that the 1981 and 1982 year-classes were in lower abundance.

Annual commercial landings from fishing grounds encompassing the range of movement for this stock (NMFS statistical areas 538, 521, 526, and 537) sharply increased in 1980, peaked in 1981, and declined thereafter (Figure 4). While much of the rise in 1980 (79%) was the result of an increase in effort, it is probable that a real increase in population biomass occurred as the faster growing segment of the 1977 year-class recruited to the fishery as three-year-olds. The 1977 year class was the largest observed in the seine survey timeseries (Figure 1, Table 1). The additional increase in landings in 1981 reflected the strength and continuing recruitment of the 1977 year-class.

In 1982, landings declined 25% but there was a substantial increase in the proportion of small and "peewee" market category fish (< 33 cm), undoubtedly the faster growing segment of the 1979 cohort. The 1983 landings declined slightly (2%) and would have principally consisted of an almost fully recruited 1979 year-class and the faster growing segment of the 1980 year-class. With the 1979 cohort's fast-growers prematurely exploited in 1982 and the 1980 year-class no stronger than its predecessor, another small decrease in landings (7%) occurred in 1984.

Presumably, the winter flounder resource has been fully exploited in recent years. If fishing mortality remains at comparably high levels and only average recruitment is expected in 1984 from the 1982 year-class, commercial landings should continue to decline. Since both the 1983 and 1984 cohorts appear to be of less than average strength, a sharp downturn in landings can be expected in 1986, with only marginal improvement foreseen for 1987.

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Table 1. Stratified mean density indices ($\bar{y}_{st}$) for young-of-the-year winter flounder, 1975-1984.

Stock Unit	Year	No. of stations	Stratified mean density index ($\bar{y}_{st}$)	95% Confidence limits
South coast	1975	14	0.31	0.293-0.327
	1976	37	0.33	0.318-0.342
	1977	37	0.62	0.602-0.638
	1978	35	0.34	0.322-0.358
	1979	37	0.49	0.473-0.507
	1980	36	0.40	0.386-0.414
	1981	33	0.33	0.315-0.345
	1982	48	0.38	0.359-0.401
	1983	49	0.17	0.168-0.181
	1984	49	0.24	0.236-0.254

Table 2. Winter flounder mean number ($\overline{y_i}$) standard deviations, number of tows, and estuarine weighting factors for each estuary sampled on south shore of Cape Cod, 1975-1984.

	Weighting Factor (n mi)	1975			1976			1977			1978			1979		
		Mean	S.D.	# Tows	Mean	S.D.	# Tows	Mean	S.D.	# Tows	Mean	S.D.	# Tows	Mean	S.D.	# Tows
Great Pond	7.31	-	-	-	.434	.1851	18	.344	.2907	18	.346	.1669	12	.344	.4279	18
Waquoit Bay	17.38	.132	.0578	9	.379	.1316	18	.871	.5567	18	.609	.2843	18	.665	.2554	18
Cotuit Bay	24.08	-	-	-	.312	.3285	15	.468	.1342	15	.245	.2150	15	.659	.3422	15
Lewis Bay	9.37	.255	.2794	18	.566	.3391	18	1.400	.4983	18	.784	.8970	18	.591	.5349	18
Bass River	20.05	.487	.2624	15	.262	.1495	24	.612	.4110	24	.139	.1199	24	.312	.2615	24
Stage Harbor	11.66	-	-	-	.124	.1044	18	.138	.0901	18	.106	.0694	18	.195	.1593	18
		1980			1981			1982			1983			1984		
Great Pond	7.31	.572	.3024	15	.212	.1656	15	.499	.3275	12	.206	.1320	12	.310	.1439	12
Waquoit Bay	17.38	.660	.4735	18	.622	.5053	15	.326	.3347	30	.261	.2262	30	.456	.4341	30
Cotuit Bay	24.08	.423	.2442	15	.322	.1901	15	.271	.2768	39	.135	.1060	39	.213	.1047	39
Lewis Bay	9.37	.119	.0889	18	.598	.3263	18	1.206	1.0303	15	.272	.1887	15	.138	.0800	15
Bass River	20.05	.358	.1524	24	.176	.1568	20	.319	.1862	30	.160	.1437	33	.215	.1870	33
Stage Harbor	11.66	.124	.1362	18	.041	.0437	15	.061	.0494	18	.056	.0549	18	.093	.0624	18

Table 3. Summary of Z statistics (corrected for ties) from Wilcoxon nonparametric tests for two-way comparisons of YOY winter flounder densities ($\bar{y}_{st}$) between years (1976-1984).

	76	77	78	79	80	81	82	83	84
75	-1.0180	-2.1740*	-0.0221	-1.4986	-0.9075	-0.1671	-0.1515	-1.1573	-0.5456
76		-2.1519*	-1.2627	-1.1098	-0.2300	-0.9226	-1.0328	-3.2527*	-1.0933
77			-2.6984*	-1.1946	-1.9971*	-2.5870*	-2.7212*	-4.3743*	-2.9089*
78				-1.9322	-1.1156	-0.0377	-0.0922	-1.4381	-0.3312
79					-0.9268	-1.8410	-1.7816	-3.8859*	-1.9756
80						-1.0075	-0.8225	-2.8461*	-1.1295
81							-0.1915	-1.6617	-0.2222
82								-1.8760	-0.2092
83									-2.4904*

* Significant at P = 0.05

Figure 1. Stratified mean density ($\overline{y}_{st}$) for young-of-the-year winter flounder captured during seine survey from southern Cape Cod estuaries, 1975-1984.

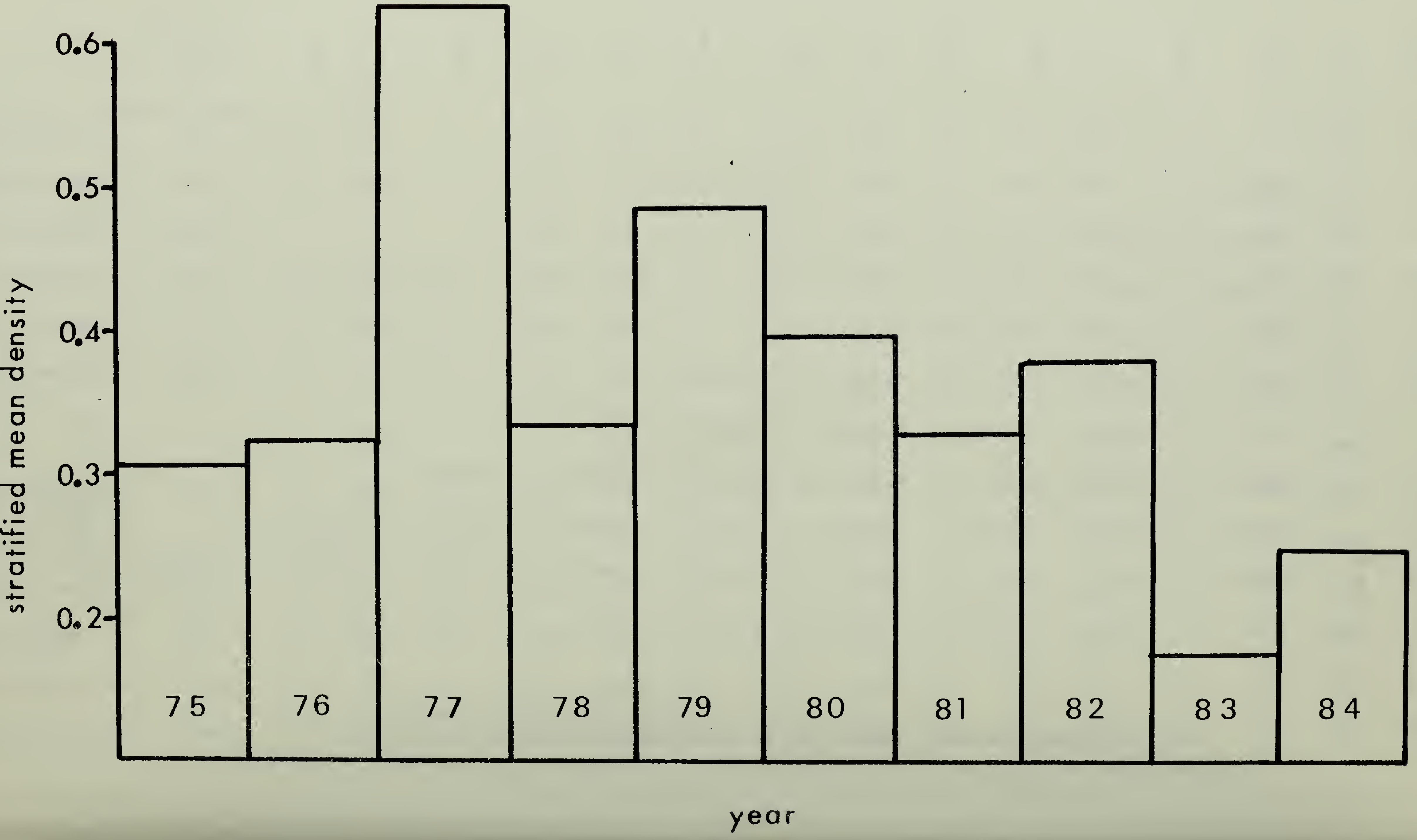


Figure 2. Stratified mean number/tow at length (smoothed by moving average of three) for winter flounder caught during spring inshore bottom surveys in regions 1-3, 1981-1984. Year-class medians derived from aged fish samples, 1981-1983.

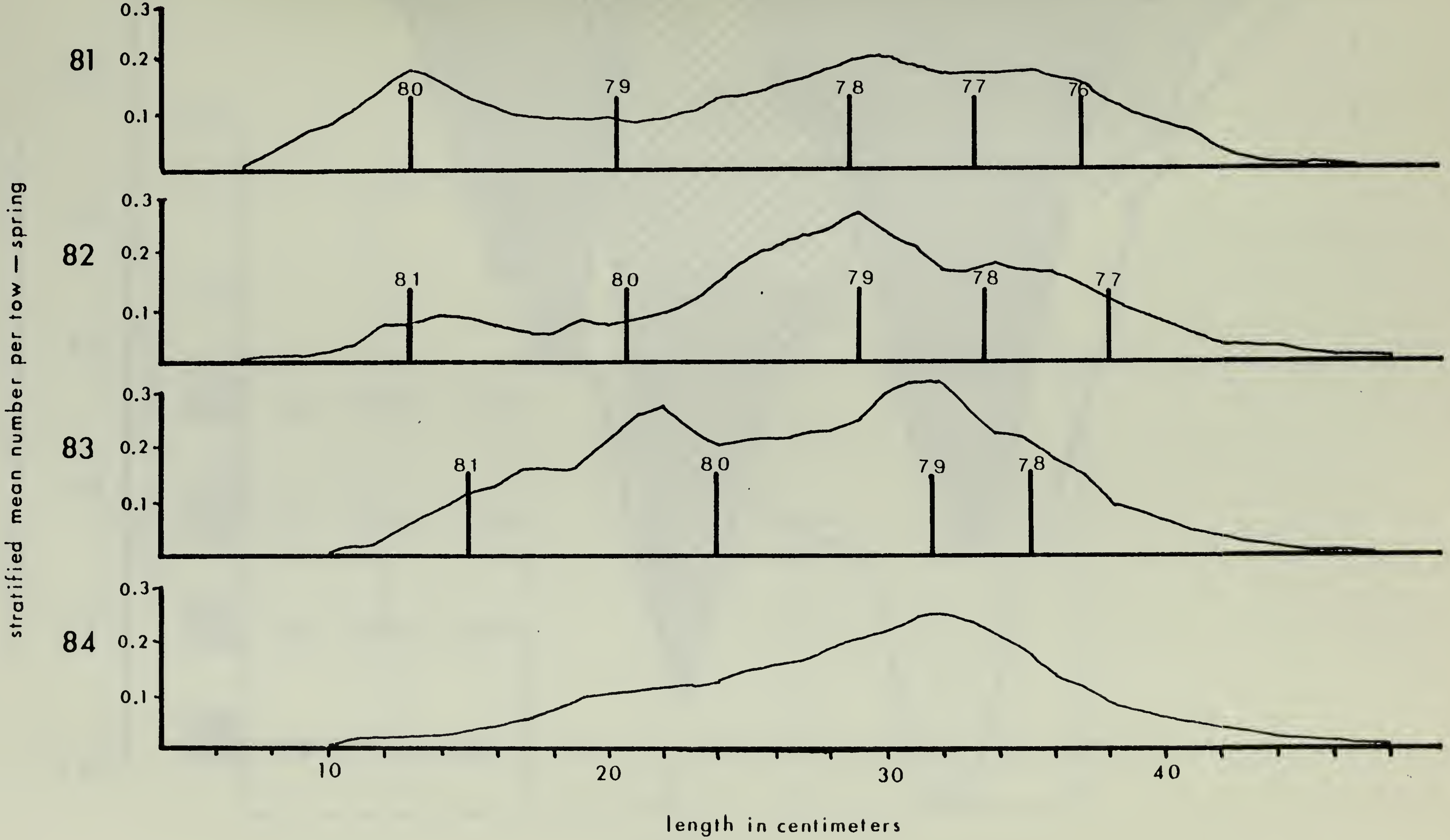


Figure 3. Winter flounder age composition and length distribution (smoothed by moving average of three) for regions 1-3, 1983 spring inshore bottom trawl survey.

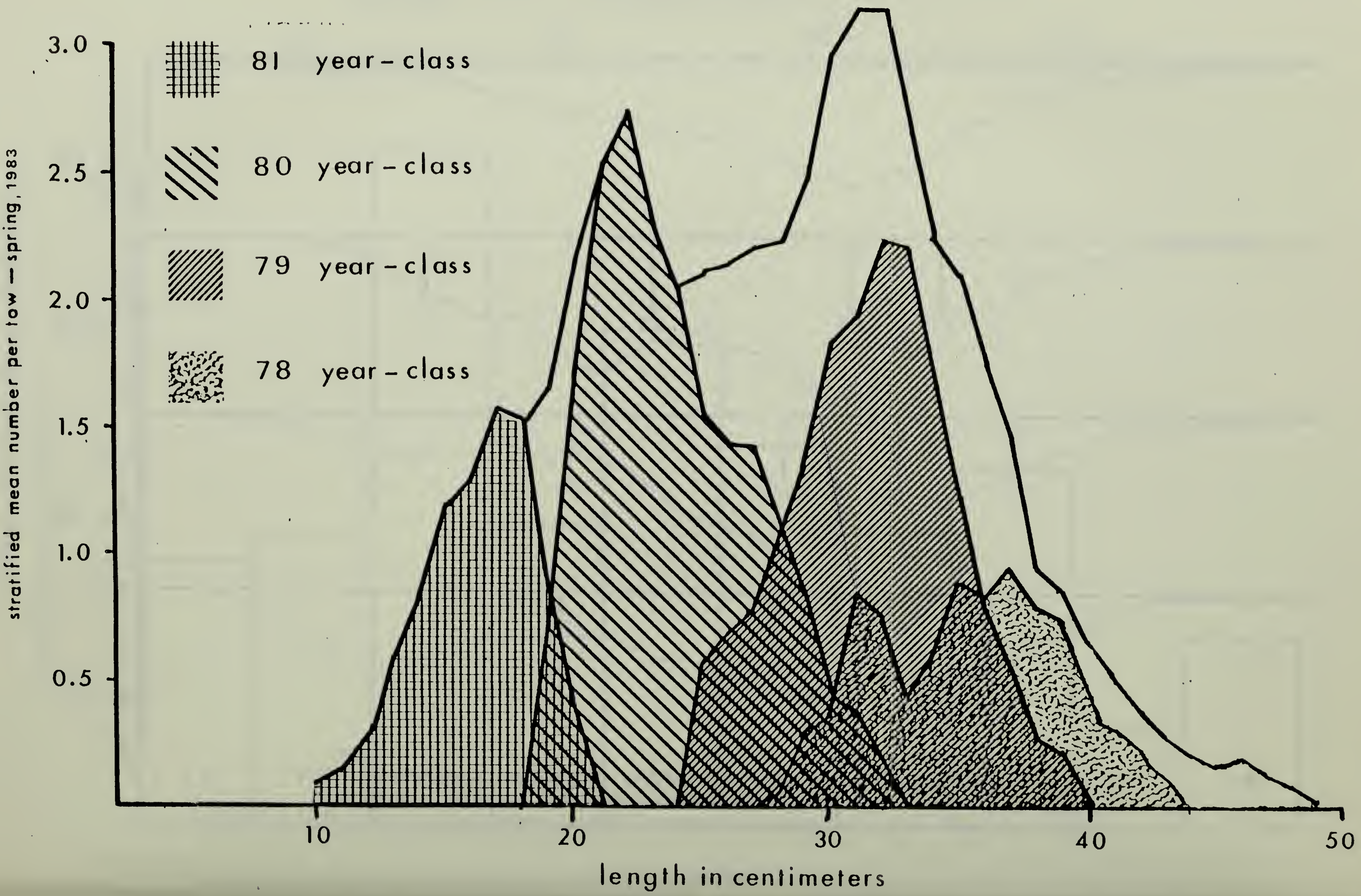
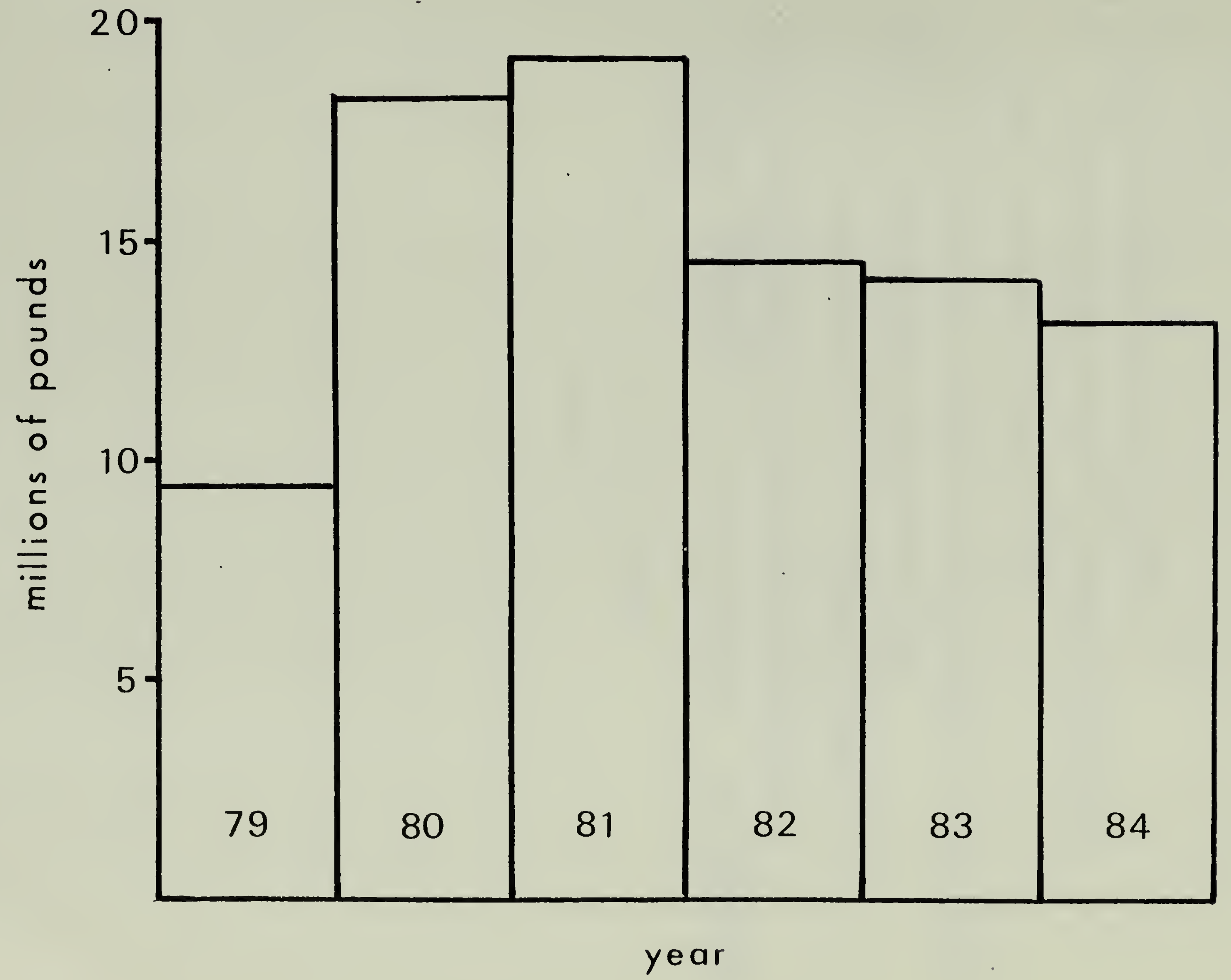


Figure 4. Commercial landings of winter flounder from NMFS statistical areas 521, 526, 537, and 538.



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